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**Emotion and the Tripartite Emotion-functioning Capacities  
in Debiasing Sunk-cost Fallacy:  
A Trait-level Review**

**Master of Research Dissertation submitted by**

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**The Open University**

**6<sup>th</sup> September 2017**



## **Abstract**

The study was aimed at examining the interplay of emotion and three emotion-functioning capacities in debiasing sunk-cost fallacy at trait-level. An online survey was used to study 378 US adults and found that dispositional positive and negative affectivity, trait-mindfulness, trait-EI and reappraisal were associated with debiasing sunk-cost fallacy. Among these factors, trait-mindfulness was found to be the most prominent attribute in association with debiasing sunk-cost fallacy. A deeper review of the participants' characteristics revealed that prolonged practice of mindfulness meditation fostered trait-mindfulness, trait-EI and reappraisal in conjunction with upregulating dispositional positive affect and downregulating dispositional negative affect. This study suggests that training which pays attention to the emotional underpinnings of decision biases and in particular mindfulness techniques may have greater promise. The study also offers interesting insight for future research directions through which the tripartite emotion-functioning capacities can be better investigated.

**Keywords:** affect, decision-making, emotion, emotion regulation, emotional intelligence, escalation of commitment, meditation, mindfulness, regret, sunk-cost

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# Chapter One

## Aims and Objectives

Financial decision-making is typically carried out under risk and uncertainty. Individuals' cognitive evaluations of risk may differ from their emotional reactions to the risk. When deciding on investments, rational decision-makers are expected to rely on their best estimates and/or available information about future consequences and not consider their already invested costs that cannot be recovered (Heilbroner and Thurow, 1981). This cognitive, economic decision-making approach is termed the consequentialist perspective. It assumes that decision-makers choose between alternative courses of action by assessing the utility (or desirability) and likelihood of their consequences, and integrating this information by expectation-based calculations to make a decision (Rick and Loewenstein, 2008). However, decision-makers tend to cling onto losing investments and increase their commitment by acquiring more of the failing investments, a behaviour known as the sunk-cost fallacy (SCF, Arkes and Blumer, 1985).

Sunk-cost situations do not just occur in investment decision-making but happen in people's everyday life. Decisions influenced by sunk-cost situations can be costly to an individual and such decision-making is likely to be irrational. For example, US students are required to pay their education upfront and they largely continue their commitment to the course once this irrecoverable cost has been paid, regardless of whether the course is useful to them subsequently (Coleman, 2010).

On the other hand, investment loss leads to negative emotion. Emotion is a double-edged sword because it can be adaptive or maladaptive. Emotions are said to be maladaptive



when they are of the wrong type, come at the wrong time, or happen at the wrong intensity (Gross, 1998). Here the right or wrong concept is relative rather than absolute. Adaptive emotions can become situation-dependent. People normally regard negative moods as undesirable but they may not be wrong all the time. For instance, sad individuals are found to be risk-acceptant whereas anxious individuals tend to be risk-averse (Raghunathan and Pham, 1999). If a risk-averse mindset is required in a particular situation, then becoming anxious for a limited time may be beneficial for the decision-makers.

Whether the decision outcome is good or bad may depend on how decision-makers manage emotions. Decision-makers are motivated to regulate their emotions in circumstances that have significant impacts now and for the future. Since holding a failing investment is costly, any skills or strategies that can attenuate the SCF should be welcome. Managing emotions became a systematic study and has gathered momentum in the last two decades. Currently, Gross (2015) recognises the need to amalgamate other concepts with emotion regulation (ER), such as emotional intelligence (EI) and mindfulness. The study proposes that effective application of these three emotion-functioning capacities may ultimately lead to greater psychological and financial well-being.

### Propositions

Initially, the study proposes positive and negative affectivity as the primary locus in which rectifying or debiasing of SCF is performed when the relevant emotion is perceived. The tripartite emotion-functioning capacities come next in debiasing SCF. As a facet of EI, ER seems to be the ability to explain individual differences in EI among people and how successful an individual is in using a particular form of ER. Mindfulness is considered as a

facilitator for ER. The theoretical underpinning for these propositions is that on one hand mindful presence (the focus on the present) and nonjudgmental acceptance conferred by mindfulness may facilitate the development of more effective ER, on the other hand the intra-individual aspects of mood regulation and utilising emotions in EI transform individuals' performance of ER. Thus, an integrative study of emotions with the tripartite emotion-functioning capacities in conjunction with debiasing SCF is warranted.

The purpose of this study is to address the following research question:

*At trait level, can positive and negative affectivity, reappraisal, EI and mindfulness debias SCF, if so, what does each of them contribute to debiasing SCF?*

To answer the research question the study begins with a review of prior research and theory that underpin the cause of SCF, the characteristics of positive and negative affectivity, and the tripartite emotion-functioning capacities. In conjunction with this review, the interconnectedness of all these attributes are examined. Hypotheses are formulated on the basis of the specific functions that these attributes can plausibly achieve in connection with debiasing SCF.

The study then goes on with an evaluation of research approach and methods. This evaluation includes the rationale of using an online, self-reporting survey and the reasons why two possible alternative methods are rejected. Potential biases and errors are examined at this design stage. A feasible sample size is determined before the survey commences.

When data are collected they are cleaned before they are used for analysis. The various statistical analyses that follow are aimed at testing the hypotheses and explaining the relative importance of the attributes in connection with debiasing SCF. The results are interpreted in the light of their theoretical implications. The findings and their robustness are discussed in the final chapter.

The study considers that at trait-level, trait-mindfulness instead of reappraisal appears to be responsible for maintaining a hedonic mood of higher dispositional positive affect and lower dispositional negative affect for decision-makers; second, trait-mindfulness seems to provide the locus for debiasing SCF largely because of the clarity provided by its retentive, accumulative capacity due to constant practice of mindfulness meditation. These are the contributions of the study.

The next chapter shows how hypotheses are derived from prior research and theory.

## Chapter Two

### Literature Review

In the domain of behavioural economics, the SCF is customarily explained by applying prospect theory (Kahneman and Tversky, 1979). This predicts that a decision-maker who is in a losing position relative to their reference point tends to take more risk than those who are in a gain or neutral position relative to their reference point. There are two cognitive biases<sup>1</sup> embedded in such psychology. The first bias is loss aversion which refers to decision-maker's perception that "the disutility of giving up an object is greater than the utility associated with acquiring it" (Kahneman, Knetsch, and Thaler, 1991: p.194), which may result in the decision-maker's escalating commitment (Staw, 1976) in anticipation of turning around a losing position<sup>2</sup>. The second is status quo bias which is the decision-maker's perspective that "the disadvantages of a change loom larger than its advantages" (Kahneman *et al.*, 1991: p.200), and causes the decision-maker not to act on the failing investment. In either event, the decision-maker will not realise a loss by selling the failing investment but continues to hold it without a rational evaluation of any expected value of the investment.

Differences in individual mindsets result in disparities in people's propensity to fall prey to SCF. For example, people who take a retrospective focus on the past and ruminate

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<sup>1</sup> A cognitive bias refers to the deviation from rationality in judgment where inferences about situations are drawn against logic (Caverni, J-P., Fabre, J-M., and Gonzalez, M., 1990).

<sup>2</sup> Staw (1981) gave his personal experience of increased investment in a failing stock as an example. Of note, this behaviour is different from professional investors' planned accumulation of a target investment in which they are convinced of the merit of the investment's actual value and buy it when the investment is priced under a target price (calculated on basis of valid financial information). Typically, these investors use stop loss measure to avoid over-exposure and may sell the investment when its price rises beyond the target price.

about failure are more susceptible to the SCF than those who can let go of past events (van Putten, Zeelenberg and van Dijk, 2010). Other than the sunk-costs that have resulted from a prior decision, estimated return or expected value of the investment created is also important in financial decision-making. Therefore, a prospective focus on future consequences has been found to avoid or mitigate SCF (Tan and Yates, 1995). However, Karlsson, Juliusson, Grankvist and Gärling (2002) found the contrary since such focus could paradoxically escalate irrational commitment, particularly when the anticipatory emotions (the instantaneous affective reaction to possible future events) about the accomplishment of a project are positive (Harvey and Victoravich, 2009). There seems to be similar psychological processes implicated in this behaviour and that of investing more in a failing investment.

#### SCF and decision-makers' emotions

Immediate emotion is formed at the moment of decision-making whereas expected emotion is experienced when the outcome of a decision materialises (Rick and Loewenstein, 2008). Emotion is considered as a short-lived but intense affective experience directed toward certain causes (Forgas, 1995). Emotion contrasts with mood which is a prolonged and diffuse affective state unrelated with any particular causes (ibid). Additionally, there are neurobiological bases for emotions. For example, regret, the emotion which fuels loss aversion, appears to arise from amygdala activation (De Martino, Kumaran, Holt and Dolan, 2009).

The psychology of increasing commitment rather than withdrawal can also be explained by regret aversion, avoidance of regret or anticipated regret (Fenton-O'Creevy, Nicholson, Soane, and Willman, 2005; Wong and Kwong, 2007). Regret "is a negative, cognitively based emotion that we experience when realizing or imagining that our present

situation would have been better, had we decided differently” (Zeelenberg, 1999: p.93). There are two facets of anticipated regret displayed in SCF. Drawing on the mental accounting bias, regret may be put on hold when the loss is still on paper but regret will be experienced instantly when the failing investment is sold. There is also the possibility of subsequent rise in investment price, following a sale, which will then aggravate the regret to be experienced. Hence, the desire to avoid the anticipated regret becomes the decision-maker’s immediate emotion which causes them to be more risk-acceptant than at the initial position so they continue to hold the failing investment (Summers and Duxbury, 2012).

#### Positive and negative affectivity

The disposition of positive affectivity is a trait that reflects individual differences in positive emotionality which explains the association between positive affect and greater satisfaction in life and improved health as positive affect changes how people perceive their inter-individual relationships and intra-individual well-being (Watson and Naragon, 2009). Dispositional positive affect is highly related to positive emotionality while dispositional negative affect is strongly correlated to negative emotionality (Watson and Clark, 1999). Negative affectivity is a “pervasive disposition that manifests itself even in the absence of any overt stress” (Watson and Clark, 1984: p.466). Negative affectivity is found to be substantially related to trait anxiety under both stress and baseline conditions, which underpins that the negative affectivity construct originated by Watson and Clark (1984) reflects individual differences in negative mood and self-concept. Such individual differences entail that people tend to act in certain ways and not in others (Gross, 2015).

Contrary to findings of Wong and Kwong (2007) as discussed earlier, negative affect is found to correlate negatively with escalation of commitment tendency for a decision-maker who is personally responsible for the outcome (Wong, Yik and Kwong, 2006). Negative affect may either be caused by the negative feedback the decision-maker receives if they continue the same course of action (regret occurs upon further fall of investment price), or stem from cognitive dissonance<sup>3</sup> if the decision-maker abandons prior action (Wong *et al.*, 2006). In either event, the resulting negative affect is strong enough to dissuade the decision-maker from the same course of action (ibid). It seems that a twist in decision-maker's perspective tilts the pointer of direction that the decision-maker is emotionally driven to behave.

A decision-maker's dispositional components of positive and negative affectivity are, by Forgas's (1995) definition, decision-maker's general mood. Mood regulation is largely considered to be conducted automatically and without decision-maker's conscious control (Mayer and Gaschke, 1988), therefore its effect may shape chronic differences in individuals' cognitive processes. The author suggests that people of high negative affect tend to feel, among others, nervous, ashamed and distressed over time, irrespective of whether or not there exists an overt stress. They also show stronger emotional reactions to negative events. These three elements of negative affect are deemed as components of regret emotion relevant to the current study.

Positive affect and negative affect appear to display different relationships at trait and state levels. They are negatively correlated at state level possibly due to situation-specific

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<sup>3</sup> Cognitive dissonance is a state of tension that occurs whenever an individual holds two inconsistent cognitions. It happens when there is the need to justify an individual's actions and decisions which are inconsistent with the individual's beliefs (Festinger, 1957).

effects, and mutually independent at trait-level (Schmukle, Egloff and Burns, 2002). Given the dispositional nature of positive and negative affectivity and the contrasting findings from Wong *et al.* (2006) and Wong and Kwong (2007), it seems likely that both or either affectivity predicts the way people behave before emotion trajectory is activated for debiasing SCF. This is investigated by the following hypothesis:

*Hypothesis 1 (H1). Dispositional positive and negative affectivity will be associated with sunk-cost fallacy such that the higher the dispositional positive affect and the lower the dispositional negative affect, the lower the propensity to exhibit the sunk-cost fallacy.*

### Emotion regulation

ER refers to “altering an emotion trajectory that would have occurred in the absence of that emotion regulation strategy, and different regulation strategies and tactics should alter the emotion trajectory in different ways” (Gross, 2015: p7). Previous research has found that individuals can improve decision-making efficacy by managing their emotions (see Heilman, Crisan, Houser, Miclea and Miu, 2010; Sokol-Hessner, Camerer, and Phelps, 2013). Empirically, Fenton-O’Creevy, Lins, Vohra, Richards, Davies, and Schaaff (2012) investigated traders’ ability in regulating emotions at times of market turmoil and found that heart rate variability, a biological marker of task-related ER, positively correlated to trader expertise and negatively correlated to market volatility. It seems that cognitive biases embedded in SCF is induced partly by affects arising when receiving the negative feedback on the prior investment decision, and partly by the processes these affects generate. Together they act as the drivers of decision outcomes behind the scene.



ER is a collection of processes that people use to influence when, what and how emotions arise, experienced and expressed (Gross and Thompson, 2007). ER processes have two components: antecedent-focused (before emotional responses become fully activated) strategies of situation selection, situation modification, attentional deployment and cognitive change, and response-focused (after emotion responses have been activated) response modulation. Appendix-1 shows the process model of ER originated by Gross (1998).

The attentional deployment process of rumination refers to directed attention to feelings and consequences (Gross, 1998). By contrast, attention allocation can be used to select new situations and modify imagined situations (Gross, 1998). Reappraisal, a cognitive change process, involves cognitive re-evaluation of situations or stimuli so as to change emotions early in the emotion-generative process (Gross and John, 2003). Reappraisal typically causes a decrease in negative affect experience and expression, and the effect is more significant in reappraising an emotional stimulus or using perspective-taking than reappraising an emotional response (Webb, Miles, and Sheeran, 2012). Other cognitive change processes include acceptance which refers to the decision-maker's acknowledging the event encountered and their incapacity to deal with it in situations that cannot be modified, such as a failing investment. Expressive suppression, a response modulation process, entails effortful inhibition of unwanted emotions, yet it rarely changes negative affect (Peña-Sarrionandia, Mikolajczak, and Gross, 2015). Typically, antecedent-focused ER processes are considered more effective than response-focused processes because the former changes the trajectory of an emotion early in the emotion-generative process (Gross and John, 2003).

People who fall prey to SCF are unable to select or modify the situation because they have already invested money in a prior decision. Therefore, this study does not consider

situation selection and modification. Since emotion is experienced at state-level rather than trait-level for response-modulation regulation, the latter is not considered here. Other antecedent-focused processes, namely attentional deployment and cognitive change, appear to be the relevant processes that relate to management of individuals' emotions with regard to debiasing SCF. Although ER processes of attention and acceptance bear the same names as two of the key components of mindfulness, each of them has different meaning in its applications when used as an ER process and in mindfulness setting. Therefore, it is more appropriate to investigate them under mindfulness.

Reappraisal is emphasised in this study because it can alter the emotional impact by changing the situational meaning of a stimulus thereby reducing some bias in decision-making. Thus, in a study of bank traders in London, Fenton-O'Creevy, Soane, Nicholson, and Willman (2011) found that high-performing, experienced traders typically applied reappraisal, rather than situation avoidance or expressive suppression, to facilitate decision-making and outperformed in their investments. Likewise, the study of Sokol-Hessner, Hsu, Curley, Delgado, Camerer, and Phelps (2009) gave participants reappraisal instructions of perspective-taking ("thinking like a trader") and found that such instructions (relative to a control group) significantly reduced participants' loss aversion, a major component of SCF. The author suggests that by paying attention to the things that help them feel positive emotions, decision-makers do not ruminate their past mistake but instead use perspective-taking to effect a cognitive change, for example, by assuming that they are still in the initial position without having committed the initial decision. This would give them clarity in deciding rationally whether to hold or sell the failing investment by applying the consequentialist approach. This argument, together with empirical evidence reviewed above suggests that reappraisal is positively related to debiasing SCF:

*Hypothesis 2 (H2). Reappraisal will be associated with sunk-cost fallacy such that the higher the use of reappraisal the lower the propensity to exhibit the sunk-cost fallacy.*

## Mindfulness

Mindfulness as a state of mind is sometimes considered as an attentional deployment process in the ER family (see Appendix-1) but it should be regarded as a stand-alone cognitive mindset which involves a number of related qualities. In Buddhist psychology *Samadhi* and *Vipassana* are two profoundly aspired attainments. *Samadhi* refers to in-depth concentration which entails the unificatory focus of the mind on its object, whereas *Vipassana* is the insight into impermanence, suffering and non-self nature of sentient beings (Dreyfus, 2011). Other than these two eudaemonist and soteriological practices, mindfulness as an intervention technique largely consists of consciousness (having interconnected functions of awareness and attention), experiencing present reality, clarity<sup>4</sup>, and non-judgmental acceptance (Brown and Ryan, 2003, 2004). Non-judgmental acceptance begins with non-judgmental observing and then accepting of whatever arises within the stream of consciousness (Dreyfus, 2011). Non-judgmental acceptance goes further than acceptance in ER, for instance, being able to be compassionate with oneself when things go wrong is a crucial attribute that non-judgmental acceptance confers. Since awareness comprises of ER components such as increased attentional deployment and cognitive change, and decreased expressive suppression, an individual's awareness of their emotion and the knowledge of how

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<sup>4</sup> Clarity includes perceptual clarity about individual's emotional states (Brown and Ryan, 2003). Clarity is also linked with EI as postulated by Salovey, Mayer, Goldman, Turvey, and Palfai (1995).

it emerges enable them to determine whether it is in their best interest to regulate the emotion that has arisen (Farb, Anderson, Irving, and Segal, 2014).

Mindfulness is found to increase positive affect and decrease negative affect (Peña-Sarrionandia *et al.*, 2015). Similarly, people report that they are happier when they focus on mindful presence than when they ponder about the past or the future (Killingsworth and Gilbert, 2010). Mindfulness meditation is practised to focus the present moment and draw attention away from the past and future. It also increases clarity and non-judgmental acceptance. Hence, mindfulness meditation is used as a transformational practice for rectifying maladaptive cognitive habits by adaptive ones (Dreyfus, 2011). Since mindfulness can be acquired by constant practice of meditation, some renowned traders practise noticing thoughts and emotions that are embedded in their decision-making, and identify disadvantageous patterns in their behaviour so that they can devise measures to rectify such behaviour. For example, CEO Gross of PIMCO uses daily meditative practice to cultivate self-awareness (Peterson, 2014).

Constant practice of meditation increases trait-mindfulness (Kiken, Garland, Bluth, Palsson, and Gaylord, 2015). Trait-mindfulness refers to the general tendency that an individual displays the non-judgmental awareness of present-moment experience in everyday life (Hanley, Garland, and Black, 2013). Since a focus on the past or future may increase susceptibility to SCF as discussed, then a focus on the present may attenuate such susceptibility. Moreover, mindfulness is found to debias SCF at trait and state levels (Hafenbrack, Kinias, and Barsade, 2014). Hence, the debiasing effect is hypothesized at trait-level as follows:

*Hypothesis 3 (H3). Trait-mindfulness will be associated with sunk-cost fallacy such that the higher the trait-mindfulness the lower the propensity to exhibit the sunk-cost fallacy.*

Mindful ER refers to the capacity to constantly remain mindfully aware, however, it is not a straight combination of mindfulness and any ER processes such as reappraisal and expressive suppression (Chambers, Gullone, and Allen, 2009). Reappraisal as a cognitive change process may result in avoidance of experience in circumstances where the use of reappraisal is driven by an unwillingness to risk experiencing or remain in contact with a particular negative emotion in relation to the initial appraisal (Chambers *et al.*, 2009), for example, decision-maker's anticipated regret as discussed. As caveats, avoidance of both pleasant and unpleasant emotional experiences may be potentially harmful while acceptance of emotional experiences (an element of mindfulness) is beneficial (Chambers *et al.*, 2009). By contrast, mindful reappraisal includes non-judgmental acceptance which alters decision-maker's relationship to these emotional experiences by learning to accept, instead of reflexively acting on, thoughts and emotions, for example, mindful decision-makers admit their mistakes without taking the mistakes too personally so that anticipated regret is relieved. Additionally, being able to be open to the experience of the present reality is helpful to those decision-makers who tend to be regretful of their past mistakes. On the other hand, expressive suppression is antithetical to mindfulness because the former inhibits rather than enhances awareness and acceptance of emotional experiences (Chambers *et al.*, 2009).

A significant body of research supports the view that individual differences in mindfulness are predictive of neurobiological processes underlying emotion-processing. Dorsomedial prefrontal cortex activation [also a neurobiological correlate of reappraisal according to Sokol-Hessner *et al.* (2013)] is found to be positively associated with individual

differences in trait-mindfulness, which suggests that trait-mindfulness is positively associated with reappraisal success (Modinos, Ormel and Aleman, 2010). Also, mindfulness fosters adaptive ER processes to act by initiating, modifying, or maintaining positive affect and negative affect in response to changing environmental settings, which in turn influences experiential, behavioural and physiological attempts in regulating experienced emotions (Chambers *et al.*, 2009).

Given the foregoing arguments particularly those that support hypotheses 2 and 3, it is probable that trait-mindfulness acts as a moderator which affects the strength and/or direction of reappraisal in debiasing SCF. Thus, the study tests:

*Hypothesis 4 (H4). The relationship between lowering the propensity to exhibit sunk-cost fallacy and reappraisal will be stronger for higher levels of trait mindfulness.*

### Emotional intelligence

EI is a collection of adaptive abilities for emotion-functioning, characterised by individual differences (Mayer, Salovey, and Caruso, 2004). The collection is differentiated into four branches in their model<sup>5</sup>: i) perception of emotion in oneself and others, ii) using emotion to facilitate decision-making, iii) understanding emotion in oneself and others, and iv) managing emotion in oneself and others. EI is found to improve intra-individual and inter-individual functioning that benefits ER functioning, which is evidenced by lowered

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<sup>5</sup> The operationalisation of EI as an ability model suggests that people need to demonstrate skill in these four branches in order to be considered emotionally intelligent. This is different from other EI approaches which are not dealt with in this study, for example, Goleman's (1998) competence model.

cortisol secretion, a neurobiological marker of reappraisal (Kotsou, Nelis, Grégoire, and Mikolajczak, 2011).

Mestre, MacCann, Guil and Roberts (2016) theorise that ER provides the mechanism by which EI influences decision outcomes. They analysed the relative strength of linkage between ER processes and EI as abilities, as shown in Appendix-2. The intersection between ER and EI shows significant inter-correlations between attention, acceptance and reappraisal. Expressive suppression appears to have no correlation with EI (see Appendix-2). These claims are in congruence with the findings of Gross and John (2003) as discussed earlier. Hence, expressive suppression is not considered in this research.

Whereas state-EI denotes the situation when EI abilities are performed, trait-EI<sup>6</sup> is defined as “the propensity to behave in a certain way in emotional situations” (Mikolajczak, 2009: p.27). When the application of adaptive emotion-functioning is used in daily life, both ability and trait operationalisations have utility. Trait-EI’s performance-based measures are considered preferable for research settings (Schutte, Manes, and Malouff, 2009). This outcome-oriented approach for trait-EI is in accord with Mayer *et al.*’s (2004) model and appears to be predictive of decision-maker’s style of how emotions are managed.

As argued earlier, it seems likely that susceptibility to SCF depends on how decision-makers manage their emotions. Low trait-EI people are more prone to behave or react in a less adaptive manner than the high trait-EI counterparts, that is, they tend to be more influenced by the outcome of a prior investment hence more affected by the emotions arising

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<sup>6</sup> This definition is different from that of Petrides and Furnham (2003: p.40) which construes trait-EI as “a constellation emotion-related self-perceptions and dispositions”. The latter definition emphasises personality traits which was not in accord with Mayer, Salovey, and Caruso (2008).

from its failing performance. Therefore, the study suggests that trait-EI relates to debiasing SCF:

*Hypothesis 5 (H5). Trait-EI will be associated with sunk-cost fallacy such that the higher the trait-EI the lower the propensity to exhibit the sunk-cost fallacy.*

While ER concerns how emotions can be managed, EI focuses on, among others, understanding individual differences in ER, and explains why high levels of EI are related to better emotion-related outcomes (Peña-Sarrionandia *et al.*, 2015). People are said to exercise intelligent ER if they can use ER in a manner that is adaptive and consistent with their goals (Wranik, Barrett, and Salovey, 2007; Peña-Sarrionandia *et al.*, 2015). Trait-EI appears to shape individual preferences, attentional focus and motives, which collectively tend to influence the choice of ER processes (Côté, DeCelles, McCarthy, van Kleef, and Hideg, 2011). Accordingly, people with higher trait-EI use more reappraisal processes than lower trait-EI people (Schutte *et al.*, 2009). It follows that people tend to promote the emotions they desire or prevent themselves from experiencing emotions they try to avoid. Further, the arguments supporting hypotheses 2 and 5 lead the author to test whether trait-EI moderates the relationship between reappraisal and debiasing SCF.

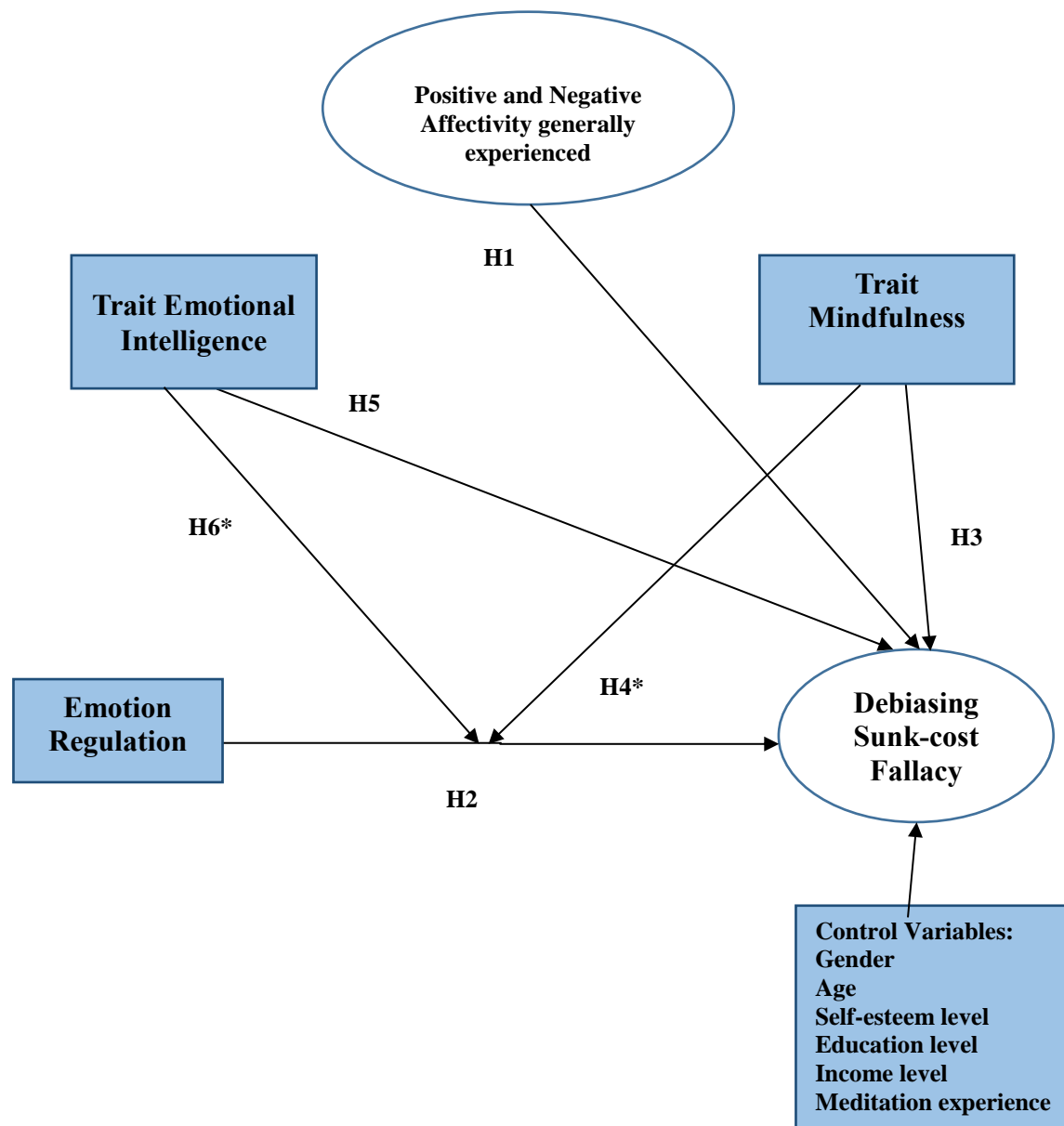
*Hypothesis 6 (H6). The relationship between lowering the propensity to exhibit sunk-cost fallacy and reappraisal will be stronger for higher level of trait-EI.*

Hypothesis 3 is formulated on the basis of established evidence on both trait and state levels. It is put to test in order to confirm whether the concept used is replicable. More valuable contributions, such as the strengths of positive and negative affectivity as compared with the tripartite emotion-functioning capacities in connection with debiasing SCF at trait-



level, would be anticipated in this study. Figure-1 below illustrates the path model of the six hypotheses to be examined:

**Figure-1 The Path Model of Hypotheses**



Note: **H4\*** and **H6\*** are moderation hypotheses.

### Control variables

There is evidence for the role of self-esteem in relation to SCF. Threatened self-esteem can cause escalation of commitment (Zhang and Baumeister, 2006) while self-affirmation interventions to preserve participants' self-esteem can de-escalate their commitments to a failing cause (Sivanathan, Molden, Galinsky, and Ku, 2008). Self-esteem is found to mediate the relationship between trait-EI and life satisfaction, since people with higher EI manage their emotions well therefore they tend to increase their self-esteem and consequently greater life satisfaction (Kong, Zhao and You, 2012). All these claims lead to the inclusion of self-esteem as a control factor.

Older adults are found to be less susceptible to SCF than younger adults (Bruine de Bruin, Parker, and Fischhoff, 2007). Younger adults are found to weigh negative information more seriously than positive information (Baumeister, Bratslavsky, Finkenauer, and Vohs, 2001) while older adults place greater weight on positive information than negative information (Carstensen and Mikels, 2005). Since the argument centres on evaluation of information, the study will include education and income levels as control variables in addition to age. Education level also relates to cognitive ability while income bracket represents socioeconomic status. Meditation experience is another relevant variable since it increases trait-mindfulness the longer an individual practises meditation. Gender difference in sunk-cost situations is unknown, therefore, gender is included as one of the control variables together with self-esteem, age, education level, income level and mindfulness meditation experience in this research.

The next chapter outlines the study method and sample.

## Chapter Three

### Methods of Data Collection

The methodology used in this study is inferential survey which assumes a positivist stance next in strength to scientific experiment. Positivism has the key concepts “that (the) social world exists externally, and that its properties should be measured through objective method” (Easterby-Smith, Thorpe and Jackson, 2015: p.339). Hence, inferential survey aims at establishing meaningful relationships between key variables and concepts from findings of a cross-sectional study. It is an explanatory research which has a logic of enquiry embedded in an induction-deduction model. Hypotheses are tested before they are allowed or disproved (Potter, 2006). The survey was conducted through the internet, arranged by Qualtrics with which the Open University has an operating contract. Online survey is a commonplace method for research because of the wide coverage and face validity accorded to the research method.

There are two main alternative methods that have been used to study emotions: scientific experiment and qualitative case study. Scientific experiment, the strongest form of positivist approach, is used in, among others, affective bioscience, cognitive psychology and behavioural economics. A particular advantage is that it allows study of physiological markers of emotion-functioning (for instance, neurobiological evidences for ER, EI and mindfulness as discussed in Chapter 2) by using high-tech equipment or techniques such as fMRI (Peterson, 2014). Another advantage is that it provides better opportunities for inferring causality than survey methods. However, access to participants can be opportunistic and sample size (number of participants to be studied) will be generally small. Another

disadvantage for scientific experiment as such is the requirement of intensive resources. Since there exists bioscientific interconnectedness of the three emotion-functioning capacities, a scientific experiment to test the six hypotheses at trait-level will not be cost effective because the current study does not require an external stimulus to trigger a course of actions or an emotion trajectory.

A qualitative case study is conducted largely by using a constructivist approach of interviewing participants to obtain data. Since researchers cannot understand participants' emotions and meanings purely by observation (a realist approach), a constructivist approach where understanding is socially constructed by researchers and the researched, is used. This is an explicatory research adopting an abductive logic of enquiry, which entails "constructing new theory rather than testing it, by [...] identifying naturally occurring surprises or deliberately creating them" (Potter, 2006: p.86). Again, access to participants can be problematic and sample size is expected to be small. Although Fenton-O'Creevy *et al.* (2011) offered a striking example of conducting a qualitative research in massive scale by studying 118 traders using thematic analysis on data collected from interviews, this research was time-consuming and resource-demanding. On the other hand, a case study confining to a small group of participants will not provide sufficient legitimacy or representation to support the tripartite interactions of emotion-functioning. The emphasis of the current study is on theory-testing of hypotheses, not constructing new theories with participants.

Having considered the inadequacy of the alternative methods relative to the time and resources available to the author, the current research adopted online survey methods to study 381 adults in America. Recruiting US participants was more cost effective than using UK participants. Also, the measures used had already been validated by US samples with item

language appropriate to that context. The author was not required to be present in America to administer the survey thanks to the internet. Participant identity was ensured by comprehensive procedures such as digital fingerprinting and their demographics were verified by Qualtrics's panel providers.

## Ethics

Participants were recruited through designated panels used by Qualtrics who charged an agreed rate per complete response. The participants were incentivised to respond by redeemable points accumulated from completing various surveys they responded to. This did not constitute an unreasonably strong inducement to participants (Oliver, 2003) because the amount they received per survey was low. As panel participants have freedom to choose the surveys they respond to, they could also withdraw at any point in the survey and were explicitly reminded of this right. Participant anonymity and confidentiality were ensured because the administration of the questionnaire was performed online through Qualtrics' system where researchers did not have access at their ends. Having no researcher-participant interaction serendipitously alleviates potential bias of social desirability caused by researcher-administered survey (discussed in a later section). Additionally, the University's ethics procedures included screening of the questionnaire to guard against sensitive questions. This was a procedure to protect participants from possible harm (Oliver, 2003). The research followed the major ethical principles advised by Oliver (2003), for example, obtaining informed consent from participants before the survey commences. It was also for the author's benefit to use clear and validated questions for the study. Equally important to

participants was the low time cost involved in the research as it took about ten minutes to complete the survey.

### Measurement

A survey is a quantitative research method which typically applies quantification, sampling and comparison in a standardised setting (Sapsford, 2007). The survey collected quantified data of performance measures for debiasing sunk-cost (via scenario-based decisions) and trait-level behavioural measures such as mindfulness and EI. Six sets of measures, each of which had been validated in previous research, were produced for the research. Appendix-3(i) displays the full set of questionnaire items. Column three denotes the scale or measure that the item belongs to. Questions 3 to 37 were items of the six primary measures. All of them were extracted from the original measures with amendments discussed in a later section. Questions 1, 2, and 38 to 42 contained six control variables and a quality check question.

### Dependent variable

Sunk-cost Bias: In an online survey, resistance to sunk-cost can only be measured by self-report questions. Since the author replicated and extended Hafenbrack *et al.*'s (2014) correlational study therefore he followed their use of the sunk-cost measures originated by Bruine de Bruin *et al.* (2007), which he obtained directly from the lead researcher. The author shortened the scale to reduce the burden on respondents and adopted seven out of the ten items by judging their face validity, for example, Question 3 draws on the disutility of eating

extra bites of the dessert against the already committed cost of ordering it. Question 5 involved money therefore the numbers were adjusted for inflation over the last ten years.

The answers ranged from 1 = *most likely to escalate the prior commitment* to 7 = *most likely resist the sunk-cost bias*. This scale was reversed to form a measure of *Debiasing SCF*. Appendix-3(ii) displays the answers in detail.

### Independent variables

Trait-mindfulness: As the study of Schutte and Malouff (2011) found association between EI and mindfulness therefore the mindfulness measures used by them, a short form (14-items) of Freiburg Mindfulness Inventory used in Kohls, Sauer, and Walach (2009), were reviewed and eight of the fourteen items were adopted. They were mindful presence and non-judgmental acceptance (four items in each dimension), which were the two most relevant dimensions to the study.

Trait-EI: The author reviewed factor loadings obtained from factor analysis for the Self-report EI Scale (originated by Schutte, Malouff, Hall, Haggerty, Cooper, Golden, and Dornheim, 1998) carried out by Goldenberg, Matheson, and Mantler (2006), and selected items of the top 4 scores from each set of measures for Mood Regulation and Utilising Emotions.

ER: The six reappraisal measures were obtained from the canonical Emotion Regulation Questionnaire (Gross and John, 2003).

Dispositional positive and negative affectivity: Watson, Clark and Tellegen (1988) developed the 20-item positive and negative affect scales (PANAS scales) and later an expanded form, the 60-item PANAS-X (Watson and Clark, 1999). The brief PANAS scales have been

robustly used and tested as self-reported measures for positive and negative affectivity, for example, Schutte and Malouff (2011) and Hafenbrack *et al.* (2014). The expanded form breaks positive and negative affects down to low-order measures, which are reported to exhibit high validity and stability, and are used as measures for either short-term (state) or long-term (trait) instructions (Watson and Clark, 1999). In this study, items selected from the brief PANAS scales which prescribed general positive affects antithetical to regret were compared with the lower-order measures from the expanded PANAS-X scales. Positive affect measures “enthusiastic” from basic positive emotion scales of Joviality, “proud” from Self-assurance, and “determined” from Attentiveness (Watson and Clark, 1999: p.2) were chosen as antithetical to regret. Negative affect measures used were those specific for regret: nervous, ashamed and distressed. These six items were adopted in the study.

All measures used in the current study were in the form of attitudinal data. Attitudinal data are not naturally-occurring as they are not collected from interactions or behaviour that would happen even if such collection was not there. Schwarz (1999) argues that attitude measurement is context-dependent, for example, question order and context may shape the answers. Online survey does not allow participants to go back to previous questions so the notion that subsequent questions influence preceding ones does not apply to the present study. This question order effect is further evaluated in the next section on common method bias. Cognitive interviewing entails that originators of questionnaire should know how participants think and feel about the questions to be answered (Schwarz, 1999). To this end, the study first adopted validated measures from relevant research which had proven construct validity. Second, five fellow students were asked to pilot-test the content validity of the questionnaire. Among them three lived in America before. They reviewed the English language used in all measures (largely written in American English) to check whether it was understandable to



them. The author found that there was no need to change the tone or words except changing the pronouns and related tenses from first person to second person singular to maintain consistency.

For all the predictor variables, participants were asked to rank the extent of agreement or frequency in their responses, for example, answers for Question 11 ranged from 1 = *strongly disagree* to 7 = *strongly agree*. In order to ensure comparability among various measures of different lengths, the Likert-scale used from questions 3 to 38 was extended to a uniform 7-point scale (the maximum points of all measures) for all measures except control variables because longer and balanced (equidistant) scales offer maximum flexibility and reliability (Darbyshire and McDonald, 2004). To streamline the bulky Rosenberg (1979) self-esteem scale (10-items), a single item self-esteem measure was used instead according to a recommendation by Robins, Hendin and Trzesniewski (2001).

Another problem for attitudinal data is that researchers are expecting certain answers (for example, up-regulate positive emotion) and the researched may know what answers are expected (Sapsford, 2007). It is normal for participants to respond pleasantly rather than unpleasantly to be seen as behaving rationally or emotionally balanced. This is a social desirability effect which is considered as "the tendency of some people to respond to items more as a result of their social acceptability than their true feelings" (Podsakoff, MacKenzie, Lee, and Podsakoff, 2003: p.882). As discussed earlier, social desirability is mitigated in a self-administered survey. There is also the risk of self-selection bias but is considered negligible as the survey invitation sent by Qualtrics's panels does not include detailed contents of the survey. In view of other potential biases in attitudinal data attributed to individual differences, the author reviewed research on method effects and appropriate strategies for minimising these biases, especially common method bias.

### Potential biases and errors

Method effects refer to participants' propensity to biasedly respond to questionnaire based on criteria other than its intended content, resulting in systematic variance that is unrelated to the study, for examples, social desirability and acquiescence (saying yes or no without due regard of the context) (Podsakoff *et al.*, 2003). Taking Hypothesis 2 as an example, the measurement of debiasing SCF is considered to correlate with the measurement of reappraisal. When the measures of debiasing SCF and measures of reappraisal are obtained by the same method, this method may cause a systematic effect on the observed correlation between measures, a phenomenon known as common method bias. There are two schools of thoughts on this bias. For some scholars, common method bias is considered as a general problem for measures obtained from the same source, in particular the participants themselves because the observed relationship between the independent variable and dependent variable could be upwardly biased (Podsakoff *et al.*, 2003), or attenuated on the contrary (Conway and Lance, 2010). Since each set of performance measures (dependent variables) and behavioural measures (independent variables) are obtained from the same participant who rates their attitudes on a self-report basis, common method is relevant in this study, which may entail artefactual covariance between the independent and dependent variables. Covariance reflects the degree to which two variables vary together (Howell, 2007).

Although Conway and Lance (2010) agree that the use of different methods is preferred to the use of common method for different constructs, they argue that adversity of the bias against research findings should not be exaggerated. They produce a list of counter-arguments against misconceptions about common method bias and approaches to mitigate its

risks. Accordingly, the author used procedures recommended by Conway and Lance (2010), as follows: First, it is reasonable to expect that self-reports are appropriate in situations where participants' perceptions are studied. This claim accords with the current study where attitudes or opinions as perceived by participants are asked, since they are the most suitable source to answer. Second, as conceptual overlap in items used to measure different constructs can prejudice relationships among variables, lack of overlap in items for different constructs can ameliorate potential bias. For example, the study did not use items to measure attention in the emotion regulation construct in order to avoid conceptual overlap for mindful presence in the mindfulness construct. Third, procedural remedies formulated at the design stage of the research to minimise threats of method effects, including among others, (a) temporal, proximal, psychological, or methodological separation of measurement, (b) counterbalancing question order, and (c) protecting respondent anonymity and reducing evaluation apprehension (Podsakoff *et al.*, 2003: pp.887-8). Example for procedure (a) was the segregation of sunk-cost questionnaire from other measures by placing the former as the beginning part of survey so that participants did not notice how the performance measures were related to the behavioural measures as they progressed on. Since the rationale for procedure (b) is to control priming effects (that is, exposure to one measure affects the response to another measure), all measures other than debiasing SCF were reshuffled so as to neutralise method biases as far as possible [Appendix-3(i)]. As for procedure (c), participant anonymity is ensured in a self-administered online survey where participants have no face-to-face interactions with researchers.

Conway and Lance (2010) particularly do not recommend post-hoc statistical control strategies because on one hand suitable statistical methods such as multitrait-multimethod matrix are resource intensive to apply, and on the other hand generally known methods are

neither effective nor capable of reducing common method bias, for example, Harrow's one-factor method. As caveats, same-method correlations may overestimate relationships which results in Type-I error, while different-method correlations may underestimate relationships leading to Type-II error. Type-I error is the incorrect rejection of a true null hypothesis ( $H_0$ ) while a Type-II error is incorrectly retaining a false  $H_0$  (Howell, 2007). It is desirable to contain Type-II error exposure by having high power in research, rather than using post-hoc methods (Conway and Lance, 2010).

### Sample

Findings of the research were subjected to statistical tests which could produce either significant or non-significant results. A non-significant result is attributed to either correctly rejecting the alternative hypothesis ( $H_1$ ) or the test is not sufficiently powerful to detect the deviations from the  $H_0$  when the  $H_1$  is true. Mayr, Erdfelder, Buchner, and Faul (2007) offer a tutorial for G\*Power as the tool for a priori power analysis to determine the required sample size  $N$  of a test given a desired  $\alpha$  level, a desired power level ( $1 - \beta$ ), and the effect size to be detected (that is, the difference between the  $H_0$  and the  $H_1$ ). From the various literature that supported the hypotheses, Hafenbrack *et al.*'s (2014) correlational study was regarded as the pivotal research, therefore Pearson's correlation coefficient ( $r = .205$ ) found in the research and probability value ( $\alpha = .01$ , rounded up from the research) were used to calculate the sample size using the G\*Power 3.1.9.2 programme. The study adopted the commonly used confidence level of 95% and one-tailed assumption (as hypotheses are unidirectional), and arrived at 367 as the required sample size. Appendix-4 shows the priori calculation. This

prior evaluation of required sample size is important since a sufficient sample is required to achieve reliability and validity of findings (Sapsford, 2007).

The next chapter deals with how collected data were compared and analysed. Various statistical methods were deployed in the analysis, aided by SPSS software. Correlations and reliability statistics were applied to check inter-relationships and internal consistency of data. Multiple regression was performed to test the predictor and control variables, and the moderation model. Then dominance analysis was run to assess the relative importance of the predictor variables that explain debiasing SCF. Additionally, the sample's characteristics are discussed alongside with demographic analysis.

## Chapter Four

### Collecting and Analysing the Data

The survey was launched in mid-June 2017 after the pilot-test had been conducted and evaluated. A quota system was set against the number of participants in different gender and age groups so as to achieve a balanced sample. During the course of data collection the author spotted some participants had finished the survey in very short time therefore he cleaned out these data by setting a time threshold of 3 minutes for admitting a complete response. In early-July 381 complete responses were secured, of which 191 were female and 190 were male. The size of individual age groups was relatively even: 21-29 ( $N = 78$ ), 30-39 ( $N = 88$ ), 40-49 ( $N = 59$ ), with the 50+ group more prominent ( $N = 156$ ). The set-up of quota succeeded in achieving a balanced sample for analysis.

Homoscedasticity and normality are the two basic assumptions for correlation and regression (Howell, 2007). Having satisfied homoscedasticity in Bartlett's test of sphericity ( $X^2 \approx 6,426$ ,  $p < .0005$ , obtained from an initial test using Exploratory Factor Analysis), tests of normality was conducted for sunk-cost/reappraisal bivariate [Appendix-5(i)] and sunk-cost/EI bivariate [Appendix-6(i)]. Three outliers were found at the lower left corner of the normal Q-Q plot of Studentized residual for both bivariate, albeit Shapiro-Wilk test showed that normality was barely significant for sunk-cost/reappraisal bivariate ( $p = .056$ ) and sunk-cost/EI bivariate ( $p = .055$ ).

The three basic diagnostic tests generally used to detect outliers are distance, leverage and influence (Howell, 2007). Given the obvious evidence for three distant outliers, the author compared values of Studentized residuals (SREs) and Studentized deleted residuals (SDRs) for the sunk-cost/reappraisal bivariate and the sunk-cost/EI bivariate. SRE and SDR

values of more than three-fold of their respective (negative) standard deviation ( $\sigma$ ) were found from three common participants. In normal distribution, the three-sigma rule (Pukelsheim, 1994) predicts that approximately one in 370 observations will differ by  $\pm 3\sigma$  or more from the mean. The probability to have three observations over  $\pm 3\sigma$  or more from the mean should have happened in a sample of 1,111 instead of 381. Data from these three participants were considered as outliers. Table-1 below exhibits some details of the outliers:

**Table-1 Outliers' scores, Studentized residuals and Studentized deleted residuals**

Participant's IP Address	Sunk cost (SC)	Mindful Presence	Non-judgmental Acceptance	EI	Reappraisal (Re)	Positive Affect	Negative Affect	SRE-SC/EI	SDR-SC/EI	SRE-SC/Re	SDR-SC/Re
38.XXX.78	1.140	7.000	6.750	7.000	6.330	6.670	2.000	-3.449	-3.500	-3.367	-3.415
65.XXX.28	1.140	7.000	6.250	7.000	7.000	6.670	3.670	-3.449	-3.500	-3.414	-3.463
97.XXX.170	1.430	6.000	6.500	6.130	6.830	7.000	6.330	-3.075	-3.110	-3.111	-3.147

Outliers are largely caused by three reasons: data entry and/or measurement errors, intentional mis-reporting, and genuinely unusual values (Osborne and Overbay, 2004). Possibility of data entry and/or measurement errors was low thanks to the electronic data processing method used in online survey. Intentional mis-reporting could happen if participants wanted to demonstrate that they managed their emotion well- the social desirability effect. Given the odds against three unusual values, the author excluded these outliers from the rest of the analysis. By using adjusted data to re-run the tests of normality for the sunk-cost/reappraisal bivariate [Appendix-5(ii),  $p = .385$ ] and sunk-cost/EI bivariate [Appendix-6(ii),  $p = .543$ ], the three outliers disappeared from the normal Q-Q plot of Studentized residual.

Cronbach's alpha was used to test the reliability or internal consistency of multiple Likert-scale items in the questionnaire. Questions were grouped under their respective dimensions and the pairwise mean of each measure/dimension was calculated. Table-2 below

shows Cronbach's alpha coefficients of the individual scores for the seven measures/dimensions. According to Sapsford (2007) Alpha coefficient of 0.60 or higher is considered acceptable for attitudinal data, as in the case of the incumbent survey.

Also shown in Table-2 are the Pearson's correlations among the seven measures which provide a test of the four correlational hypotheses: H1 was supported as debiasing SCF positively correlated to positive affect ( $r = .128$ ) while inversely correlated to negative affect ( $r = -.190$ ). H2 was supported because there was positive correlation between reappraisal and debiasing SCF ( $r = .102$ ). H3 was partially supported because dispositional non-judgmental acceptance did not correlate with debiasing SCF while only dispositional mindful presence positively correlated with debiasing SCF (.193). This result was comparable to Hafenbrack *et al.*'s (2014) finding of trait-mindfulness/debiasing SCF correlation ( $r = .205, p < .005$ ). H5 was supported because there was positive correlation between trait-EI and debiasing SCF (.118).

**Table-2 Correlations and Cronbach's Coefficients**

Variable	Debiasing sunk-cost	Mindful presence	Nonjudgmental acceptance	EI	Reappraisal	Positive affect	Negative affect
Debiasing sunk-cost	<b>.504</b>						
Mindful presence	.193**	<b>.754</b>					
Nonjudgmental acceptance	.090	.665**	<b>.818</b>				
EI	.118*	.721**	.739**	<b>.834</b>			
Reappraisal	.102*	.657**	.722**	.803**	<b>.874</b>		
Positive affect	.128*	.656**	.732**	.758**	.674**	<b>.718</b>	
Negative affect	-.190**	-.418**	-.544**	-.493**	-.430**	-.633**	<b>.775</b>

Note. N = 378. **Cronbach's Alpha coefficients** of individual measures in **boldface** lie diagonally in the table.

\*\*Correlation is significant at the 0.01 level (2-tailed).

\*, Correlation is significant at the 0.05 level (2-tailed).

Multiple regression analysis was performed to assess the predicted main effects of debiasing SCF by independent and control variables. Table-3 below shows the details of regression coefficients, significant R square values, and a check for multicollinearity. Among the independent variables, only dispositional negative affect and mindful presence



had significant regression coefficients (dispositional negative affect:  $B = -.102, p < .05$ ; dispositional mindful presence:  $B = .269, p < .005$ ). As regards control variables, only age had a significant regression coefficient ( $B = .157, p < .0005$ ). The overall R square (.121) of the multiple regression for all predictor and control variables was significant [ $F(12, 346) = 3.954, p < .0005$ ]. Thus, age and mindful presence were found to predict debiasing SCF positively while dispositional negative affect was found to predict debiasing SCF inversely. There were lack of significant results for other independent and control variables despite strong inter-correlations among them. It may be a consequence of multicollinearity between variables, for example, the trait-EI/reappraisal correlation was high ( $r = .803$ ) and the variance inflation factor (VIF) value for trait-EI found in the multiple regression was higher than 4, advising that multicollinearity was present. However, the EI/reappraisal pair of predictors did not pose difficulty for interpretation as they were not significant enough to result in combined prediction of the dependent variable. Overall, the regression coefficients were weak, with dispositional mindful presence having the highest influence in predicting the variability of debiasing SCF.

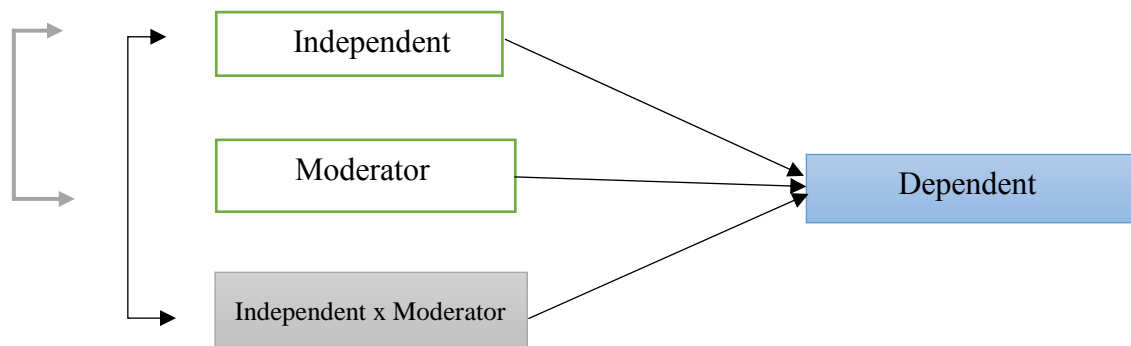
**Table-3 Debiasing SCF regressed on the predictor and control variables**

<u>Predictor variable</u>	<u>Unstandardised coefficient</u>			<u>R square</u>	<u>Adjusted R square</u>	<u>VIF</u>
	<u>B</u>	<u>t</u>	<u>Significance</u>			
Negative affect	-.102	-2.049	.041			2.128
Positive affect	.051	.568	.571			3.836
Mindful presence	.269	3.243	.001			2.513
Nonjudgmental acceptance	-.099	-1.274	.203			3.283
EI	.054	.455	.650			4.296
Reappraisal	-.015	-.165	.869			3.205
<u>Control variable</u>						
Age	.157	3.596	.000			1.111
Gender	-.019	-.191	.849			1.063
Self-esteem	-.096	-1.928	.055			2.729
Income bracket	.004	.085	.933			1.225
Education level	.023	.473	.637			1.150
Meditation experience	-.041	-1.001	.317	.121	.090	1.099

N ranges from 366 to 378.

### Proposed Moderation

H4 and H6 were formulated on the basis of moderation effect, which refers to the relationship between reappraisal (the independent variable) and resistance to SCF (the dependent variable) that depends on the value of the moderator (trait-mindfulness for H4, trait-EI for H6). Figure-2 below shows the statistical model of mediation. Both H4 and H6 moderations belong to a model of a continuous dependent variable and continuous independent variable, modified by a continuous moderator. The moderation effect was investigated by regression analysis. As found in the correlation analysis, dispositional mindful presence and nonjudgmental acceptance positively correlated with reappraisal ( $r$  values were .657 and .722) while trait-EI positively correlated with reappraisal (.803). In order to avoid multicollinearity due to high correlation of these predictors, all variables except the resistance to sunk-cost items were mean-centred, and the interaction terms (independent x moderator) were calculated before entering into regression.



**Figure-2 Statistical model of moderation**



-  Model 1: Interaction between independent variable and moderator
-  Model 2: Interaction among independent variable, moderator, and independent variable X moderator

Table-4 below exhibits the coefficients obtained for model 2 (with interaction) variables and the variation by comparing R square change from model 1 (without interaction) to model 2 for debiasing SCF regressed on reappraisal with trait-EI and trait-mindfulness as moderators.

Trait-EI moderation: A two-step hierarchical multiple regression was run to examine the increase in variation explained by the addition of an interaction term between trait-EI as moderator and reappraisal as independent variable in debiasing SCF in a two-way interaction. Trait-EI did not moderate the effect of reappraisal on debiasing SCF, as it was not evident by a statistically significant increase in total variation ( $F(1, 374) = 1.793, p = .181$ ). As R square change advises the strength of the variation between the outcome and all of the predictors combined together, R square change of .5% meant there was no significant interaction. Thus, H6 was not supported.

Trait-mindfulness moderation: A two-step hierarchical multiple regression was run to evaluate the increase in variation explained by the addition of interaction terms between dispositional mindful presence and nonjudgmental acceptance as joint moderators and reappraisal as the independent variable in debiasing SCF in a three-way interaction. The small change in R square of 1.6% was not significant ( $F(4, 370) = 1.530, p = .193$ ). Hence, H4 was not supported.

**Table-4 Testing moderation for trait-EI and trait-mindfulness as moderators**

<u>Model 2 variable</u>	<u>Trait-EI</u>			<u>Trait-mindfulness</u>		
	<u>B</u>	<u>t</u>	<u>R square change</u>	<u>B</u>	<u>t</u>	<u>R square change</u>
Intercept	4.420	79.153*		4.432	77.116*	
Mean-centred EI	.131	1.361				
Mean-centred Reappraisal	.023	.281		.003	.034	
Mean-centred Mindful Presence				.280	3.591*	
Mean-centred Nonjudgmental Acceptance				-.070	-1.060	
Mean-centred EI						
x Mean-centred Reappraisal	.050	1.339	.005			
Mean-centred Mindful Presence						
x Mean-centred Reappraisal				.131	1.998	
Mean-centred Mindful Presence						
x Mean-centred Nonjudgmental Acceptance				-.038	-.661	
Mean-centred Nonjudgmental Acceptance						
x Mean-centred Reappraisal				-.037	-.675	
Mean-centred Mindful Presence						
x Mean-centred Nonjudgmental Acceptance						
x Mean-centred Reappraisal				-.004	-.162	.016

Note: N = 378.

\* *t* values are significant ( $p < .0005$ ).

Despite the face validity of the tripartite emotion-functioning capacities, debiasing SCF using reappraisal as the predictor and trait-EI and trait-mindfulness as separate moderators were not supported. This finding may be a false negative since moderation effect is more difficult to detect in a non-experimental research than in an experimental setting and interactive effects require greater statistical power to detect. McClelland and Judd (1993) postulate factors that account for the differential statistical power of experiments over field studies for detecting interactions. Among them are less error found in experimental set-up than survey study, and theoretical and other constraints on the nature of interaction in non-experimental research may restrict the magnitude of the moderated regression coefficient. In the proposed trait-EI moderation, the moderated regression is expressed as:

$$\text{Debiasing SCF} = B_0 + B_1\text{Reappraisal} + B_2\text{Trait-EI} + B_3\text{Reappraisal} \times \text{Trait-EI} + e$$

All regression coefficients are reported in Table-4 under their respective rows. Assuming all things equal, the greater the value of the partial regression coefficient  $B_3$ , the greater the moderating effect of trait-EI on the relationship between reappraisal and debiasing SCF.  $B_3$  was only .05, suggesting an extremely weak moderating effect did it ever exist.

The survey was a trait-level setting. The participants may not have perceived any emotion episodes when they answered the sunk-cost questions. That already stopped the functioning of the chain of EI processes, namely, the second branch of using emotion-related information to facilitate decision-making, the third as understanding emotion or emotion knowledge, and the fourth branch- managing ER.

The regression coefficients in the proposed trait-mindfulness/reappraisal moderation were small and inversely related to one another (see Table-4), rendering moderation

nonsignificant. Similar to the trait-EI/reappraisal moderation, the reason why trait-mindfulness/reappraisal moderation was not supported appears to be attributed to inoperative reappraisal due to no stimulus.

Nonsignificant results for the moderation hypotheses may be attributed to Type II error. To this, a post-hoc evaluation of the power achieved in the study was performed [Appendix-7(i)]. The author referred to the lowest significant correlation in Table-2 and adopted the sunk-cost/reappraisal correlation ( $r = .102$ ,  $p = .047$ ) to calculate power ( $1 - \beta$ ) using G\*Power. The power was found to be low (.622), suggesting that some of the multivariate relationships were highly exposed to Type II error as the probability of making the error could be as high as 37.8%. Retrospective power offers no additional information for explaining the non-significance of findings (Howell, 2007). The only solution is to increase the sample size.

The varying degrees of correlations among the predictors and dependent variable may cause confusion on what theory should take precedence in explaining the phenomena embedded in the data, especially when multicollinearity existed between some variables, for example, the EI/reappraisal correlation. To answer the question on relative importance of predictors in the sample under study, Budescu's (1993) dominance analysis was applied to positive and negative affectivity, and the tripartite emotion-functioning capacities (see Table-5). In the analysis, all predictors were placed in descending order of their (significant) correlations with debiasing SCF. Mindful presence was found to attain complete dominance over all other individual variables. It explained the largest unique variance and the other variables contributed little variance over and above the effect of mindful presence. In terms of their respective compositions in the total R square, mindful presence contributed the most (42%), followed by negative affect (39%), positive affect (8%), EI (6%), and reappraisal

(5%). Positive affect, EI and reappraisal were found to be less important in debiasing SCF as the analysis de-emphasised redundant predictors.

**Table-5 Dominance Analysis for affectivity and tripartite emotion-functioning capacities**

<u>Submodel</u>	<u>Total R Square</u>	<u>Additional contribution of</u>				
		<u>X1</u>	<u>X2</u>	<u>X3</u>	<u>X4</u>	<u>X5</u>
Null and k = 0 average		.037	.036	.016	.014	.010
X1	.037		.014	.000	.001	.001
X2	.036	.016		.000	.001	.001
X3	.016	.021	.020		.001	.000
X4	.014	.024	.023	.003		.000
X5	.010	.028	.026	.006	.004	
k = 1 average		.022	.021	.003	.002	.001
X1 X2	.052			.005	.005	.004
X1 X3	.037		.020		.001	.001
X1 X4	.038		.019	.000		.000
X1 X5	.038		.017	.000	.000	
X2 X3	.036	.021			.001	.000
X2 X4	.037	.020		.000		.000
X2 X5	.037	.019		.000	.000	
X3 X4	.017	.021	.020			.000
X3 X5	.017	.022	.020		.001	
X4 X5	.014	.024	.023	.003		
k = 2 average		.021	.020	.002	.001	.001
X1 X2 X3	.057				.002	.001
X1 X2 X4	.057			.002		.001
X1 X2 X5	.056			.003	.002	
X1 X3 X4	.039		.020			.000
X1 X3 X5	.039		.020		.000	
X1 X4 X5	.038		.019	.001		
X2 X3 X4	.037	.022				.000
X2 X3 X5	.037	.022			.000	
X2 X4 X5	.037	.020		.000		
X3 X4 X5	.017	.022	.020			
k = 3 average		.021	.019	.001	.001	.001
X1 X2 X3 X4	.059					.000
X1 X2 X3 X5	.058				.001	
X1 X2 X4 X5	.057			.002		
X1 X3 X4 X5	.039		.020			
X2 X3 X4 X5	.037	.022				
k = 4 average		.022	.020	.002	.001	.000
X1 X2 X3 X4 X5	.059					
Overall average		.025	.023	.005	.004	.003

Note: X1= Mindful presence, X2= Negative affect, X3= Positive affect, X4= EI, X5= Reappraisal  
Independent variable= debiasing sunk-cost

Dominance analysis gave clarity on the operational importance among both positive and negative affectivity and the tripartite emotion-functioning capacities. The result that there was no significant regression coefficient for positive affect, EI and reappraisal in predicting debiasing SCF reflects the potential redundancy of these attributes in predicting resistance to SCF.

Before the foregoing analyses were used to illuminate findings, two additional analyses were conducted to ascertain: i) the inter-relationships of the individual items of debiasing SCF measure, ii) relationships among debiasing SCF and the control variables.

#### Supplementary analysis I

In contrast to multicollinearity seen in some bivariate which had high Cronbach's coefficients, a moderate Cronbach's coefficient found in the resistance to sunk-cost measure (.504) had a different implication. Owing to this modest reliability, the following exploratory analysis was carried out to assess individual measures of debiasing SCF.

<b>Table-6 Pearson's correlations for the seven debiasing SCF items</b>							
Predictor/control variable	Q3: Eating a dessert	Q4: Writing a toast	Q5: Buying a ring	Q6: Wearing the stars?	Q7: Cello or guitar?	Q8: Movie or coffee?	Q9: Resort or home?
Mindful presence				.157**	.101*	.152**	.114*
Nonjudgmental acceptance	.150**						
EI	.120*						
Reappraisal	.101*						
Positive affect	.114*						
Negative affect	-.153**			-.115*	-.103*		-.135**
Age	-.127*				.118*	.192**	.285**

Note: N = 378. Only significant correlations are shown.

\*\* and \* denote correlations at 1% and 5% significant levels respectively.



To understand more about inter-relationships among the seven items of the resistance to sunk-cost measure, Pearson's correlations of the seven items with age and the six predictor variables and were obtained (Table-6 above). Mindful presence was found to correlate positively to Questions 6, 7, 8 and 9 while negative affect correlated negatively to Questions 3, 6, 7 and 9. Age correlated to Questions 3, 7, 8 and 9. Negative affect and age may be inversely dependent on each other. Question 3 had bivariate correlations with all predictor variables except mindful presence.

Multiple regression was performed for each of the seven questions as dependent variable with the predictor and control variables (see Table-7 below). Mindful presence, negative affect and age were the variables that had significant regression coefficients across three questions, which were marginally higher in absolute value than those found in Table-3. Contrasting results found in gender and self-esteem suggest that the type of decision being made depends on how the participants perceived about the scenario-based questions. Other variables with significant coefficients found in less than three questions seemed not to be strong enough to have significant coefficients in the complete debiasing SCF regression (c.f. Table-3). No significant regression coefficient was found in Question 7.

Overall, these findings from correlations and regression suggest that the antecedents of SCF may be context-dependent, that is, depending on the type of decision being made. For example, the multi-correlated Question 3 ended up a single regression for debiasing SCF. It asked participants whether to continue prior commitment at their disutility. Possibly, those who chose to finish may not want to appear wasteful according to Arkes and Blumer (1985), whereas older people may have a different perspective.

**Table-7 Regression coefficients (B) for the resistance to sunk-cost items**

Predictor/control variable	Q3	Q4	Q5	Q6	Q7	Q8	Q9
Mindful presence				.441**		.456**	.601*
Negative affect		-.272**		-.207**			-.222**
Positive affect			.381**				
EI							-.508**
Nonjudgmental acceptance		-.353**	-.486*				
Age	.229**					.307*	.432*
Gender		-.582*	.613*				
Self-esteem			.213**	-.281*			
Length of meditation practice				-.210**			

Note: N ranges from 366 to 378. Only significant coefficients are shown.

\*\* and \* denote  $t$  values at  $p < .05$  and  $p < .005$  respectively.

### Supplementary analysis II

Varying degrees of debiasing SCF situations were evaluated according to sample's demographics. To this, mean scores of different classes of ordinal data from the control variables were compared and the mean differences were tested whether significant results could be found (Howell, 2007). Table-8 below shows the control variables' correlations with debiasing sunk-cost measure and basis of their mean comparisons.

**Table-8 Control variables- correlations with debiasing SCF and basis of mean comparisons**

Control variable	N	Correlation with debiasing sunk-cost	Mean score / group	Data characteristic
Gender	378			Dichotomous: 1 = female, 2 = male
Age	378	.212*	46	4 classes of ordinal data
Self-esteem	378	.061	4.76	Continuous on a 7-point Likert scale
Income bracket	366	.051	\$41,200	4 classes of ordinal data
Education level	370	.018	Undergraduate study	5 classes of ordinal data
Length of mindfulness meditation practice	378	-.034	Less than three months	5 classes of ordinal data

\* Correlation is significant at the 0.01 level (2-tailed).

First, to answer whether gender may have an effect on susceptibility to sunk-cost Levene's test for homoscedasticity was used. Here the two genders were treated as two independent samples, both subjected to *t*-test for equality of means (Howell, 2007). Data were presented as mean  $\pm$  standard deviation. Debiasing SCF score decreased from female ( $4.46 \pm .92$ ) to male ( $4.40 \pm 1.08$ ). The equal variances assumption was upheld ( $p = .296$ ). There was no statistically significant difference between female and male in debiasing SCF ( $t = .063, p = .950$ ). It seems that gender has no bearing on debiasing SCF.

**Table-9 One-way ANOVA for differences among age groups and three related measures**

Age group	Age groups	Mean difference	Debiasing Sunk-cost	Negative Affect	Self-esteem
		N			
50+	21-29 years	78	.476*	-.782*	.635*
	30-39 years	85	.442*	-.405	.158
	40-49 years	59	.252	-.535	.434
	50 and older	156			
	Total	378			
50+	21-29 years	Tukey HSD Std. Error	.131	.195	.229
	30-39 years		.127	.189	.223
	40-49 years		.144	.215	.253
50+	21-29 years	Tukey HSD Sig.	.002	.000	.030
	30-39 years		.003	.143	.893
	40-49 years		.302	.063	.316
50+	21-29 years	95% CI Lower Bound	.139	-1.285	.043
	30-39 years		.114	-.894	-.417
	40-49 years		-.120	-1.089	-.218
50+	21-29 years	95% CI Upper Bound	.814	-.279	1.227
	30-39 years		.770	.084	.734
	40-49 years		.624	.020	1.087
<b>ANOVA</b>		<b>F (3, 374)</b>	6.294	6.052	2.914
		<b>Sig.</b>	.000	.000	.034

\*The mean difference is significant at the 0.05 level.

Second, as sunk-cost only correlated age ( $r = .212, p < .01$ ) but not the other control variables, it was useful to investigate the relationship between debiasing SCF and different age groups. A one-way ANOVA (Howell, 2007) was performed to ascertain whether the

ability to debias SCF was different for different age groups. Debiasing SCF score decreased from the 21-29 bracket ( $4.22 \pm .96$ ), to 30-39 ( $4.25 \pm 1.08$ ), then increased to 40-49 ( $4.44 \pm .91$ ) to 50+ ( $4.69 \pm .87$ ). As shown in Table-9 above, the differences between these age groups was statistically significant ( $F(3, 374) = 6.294, p < .0005$ ). Tukey post-hoc analysis revealed that the increase from 21-29 to 50+ [.476, 95%CI (.139 to .814)] was statistically significant ( $p < .005$ ), as well as the increase from 30-39 to 50+ [.442, 95%CI (.114 to .770);  $p < .005$ ]. No other group differences were statistically significant.

Age was found to correlate inversely with negative affect ( $r = -.199, p < .01$ ) and positively with self-esteem ( $r = .124, p < .05$ ). With a relatively high Pearson's correlation in absolute value ( $r = -.649, p < .01$ ), negative affect correlated inversely but strongly with self-esteem. By controlling age, one-way ANOVA and Tukey post-hoc analysis were conducted for these related measures. For sake of brevity, means and deviations for the items under test were disregarded when reporting results. The comparison reviewed that the 50+ attained lower negative affect [-.782, 95%CI (-1.285 to -.279),  $p < .0005$ ] and higher self-esteem [.635, 95%CI (.043 to 1.227),  $p < .05$ ] than the 21-29 age group. No other age group differences were statistically significant. In line with the literature reviewed, older people especially those at fifty or more were found to be less susceptible to SCF than younger people (21 to 39). The 50+ group was also found to attain lower negative affect and higher self-esteem than the 21-29 age group. However, there was no correlation between self-esteem and debiasing SCF, nor did self-esteem correlate to trait-EI (as argued by some researchers, see Chapter Two). The finding that older people with low negative affectivity had association with debiasing SCF is echoed by findings of Suri and Gross (2012) that older people attain successful ER and that one factor may be reduced responsiveness to regret, a core element leading to SCF. Supported by the negative affect/self-esteem correlation, people high in

negative affectivity are prone to show low self-esteem (Watson and Clark, 1984). The effect of self-esteem appears to be consequential rather than causal. Possibly, older people have got affluent experience in managing their emotions particularly downregulating negative affect, suggesting that their self-esteem is actualised as a result of lowered negative affectivity and susceptibility to SCF is attenuated.

Third, one-way ANOVA and Tukey post-hoc analysis were used again to test whether debiasing SCF was influenced by cognitive and socio-economic ability represented by different income bracket and education level. There were 73 in the \$0 to \$14,999 income bracket, 94 in \$15,000 to \$29,999 group, 121 in \$30,000 to \$59,999 group, and 78 in the \$60,000+ income group. As regards education, there were 5 in the secondary school level, 173 in the high school or technical/vocational training level, 70 in undergraduate study, 88 graduated from universities, and 34 were at postgraduate level. No statistically significant differences were found among different income or education groups, suggesting that cognitive and socio-economic abilities may not play any roles in debiasing SCF.

The last but not the least control variable, Mindfulness meditation practice, was found to provide a versatile role in the study. Mindfulness previously experienced by participants, expressed in terms of the time taken to practise meditation, was differentiated among practitioners by five groups. Table-10 below shows the various periods of time meditation was practised by participants, and the number of participants in each group. Also shown in the Table are one-way ANOVA and Tukey post-hoc analysis which compared the different mindfulness practising groups against resistance to sunk-cost, the six emotion-functioning measures, and self-esteem. Meditation practice was found to have no correlation with debiasing SCF. However, those who practised for three years or more was found to be

significantly different from those who practised for three months but less than a year [.741, 95%CI (.043 to 1.439),  $p < .05$ ].

Meditation practice was also found to be uncorrelated to negative affect but the group who practised for three years or more was found to have significantly lower negative effect than those who practised for less than three months [-1.331, 95%CI (-2.290 to -.373);  $p < .005$ ], and lower than those who practised for three months but less than a year [-1.036, 95%CI (-2.070 to -.002);  $p < .05$ ], and again lower than those who practised for a year but less than three years [-1.269, 95%CI (-2.374 to -.165);  $p < .05$ ].

The following control variables were found to positively correlate with meditation practice: positive affect ( $r = .139$ ); mindful presence ( $r = .209$ ); nonjudgmental acceptance ( $r = .150$ ); EI ( $r = .188$ ); reappraisal ( $r = .191$ ); self-esteem ( $r = .167$ ). These correlations were significant at the .01 level. The group who practised for three years or more was compared to those who never or had practised but soon discontinued. The former was found to have statistically significant results than the latter in the following: higher positive effect [.794, 95%CI (.181 to 1.408);  $p < .005$ ]; higher mindful presence [.713, 95%CI (.181 to 1.245);  $p < .005$ ]; higher nonjudgmental acceptance [.709, 95%CI (.056 to 1.362);  $p < .05$ ]; higher EI [.676, 95%CI (.195 to 1.158);  $p < .005$ ]; higher reappraisal [.851, 95%CI (.296 to 1.406);  $p < .0005$ ]; and higher self-esteem [1.190, 95%CI (.264 to 2.116);  $p < .005$ ].

When compared with the non-practitioners, those who practised for three years or more were found to have higher dispositional positive effect, higher dispositional mindful presence, higher dispositional nonjudgmental acceptance, higher trait-EI, higher reappraisal, and higher self-esteem. In tandem with Kiken *et al.*'s (2015) finding that constant practice of meditation increases trait mindfulness, long-term practitioners appeared to distinguish themselves from non-practitioners in the attributes discussed. Also, long-standing

practitioners differentiated themselves in managing negative affect from those who practised for relatively shorter periods, although the former group was not significantly different from non-practitioners. This may be due to anti-selection as people typically treat mindfulness meditation as a kind of cognitive behavioural therapy or stress reduction programme (e.g. Kabat-Zinn, 2003) and only practise meditation when they feel the need or are advised to do so. On the other hand, mindfulness is a naturally-occurring phenomenon that can present in non-practitioners of mindfulness meditation (Brown and Ryan, 2003; Kabat-Zinn, 2003). The finding of progressive downregulation of dispositional negative affectivity shown by meditation practitioners seems to concur with their ability in upregulating dispositional positive affectivity, trait-mindfulness, trait-EI and reappraisal.

The foregoing analyses and interpretations are translated into findings in Chapter Five.

**Table-10 One-way ANOVA for differences among meditation practitioners and eight related measures**

Period practised	Different period practised	Mean difference	Debiasing Sunk-cost	Positive Affect	Negative Affect	Mindful Presence	Nonjudgmental Acceptance	EI	Reappraisal	Self esteem
		N								
Three years or more	Never or had practiced but soon discontinued	256	.283	.794*	-0.763	.713*	.709*	.676*	.851*	1.190*
	Less than three months	43	.552	.688	-1.331*	.406	.566	.424	.496	1.451*
	Three months but less than a year	30	.741*	.663	-1.036*	.449	.316	.475	.778*	.813
	A year but less than three years	23	.646	.829	-1.269*	.333	.607	.511	.638	.846
	Three years or more	26								
Three years or more	Never or had practiced but soon discontinued	Tukey HSD Std. Error	.196	.224	.290	.194	.238	.176	.203	.338
	Less than three months		.236	.270	.350	.234	.288	.212	.244	.408
	Three months but less than a year		.255	.291	.377	.252	.310	.229	.264	.440
	A year but less than three years		.272	.311	.403	.270	.331	.244	.282	.470
Three years or more	Never or had practiced but soon discontinued	Tukey HSD Sig.	.599	.004	.067	.003	.026	.001	.000	.004
	Less than three months		.136	.083	.002	.414	.283	.268	.254	.004
	Three months but less than a year		.031	.155	.049	.388	.847	.233	.028	.347
	A year but less than three years		.124	.061	.015	.732	.357	.226	.159	.374
Three years or more	Never or had practiced but soon discontinued	95% CI	-.254	.181	-1.557	.181	.056	.195	.296	.264
	Less than three months		-.095	-.053	-2.290	-.236	-.222	-.157	-.174	.333
	Three months but less than a year	Lower Bound	.043	-.135	-2.070	-.243	-.534	-.152	.055	-.392
	A year but less than three years		-.100	-.024	-2.374	-.407	-.302	-.159	-.134	-.441
Three years or more	Never or had practiced but soon discontinued	95% CI	.819	1.408	.032	1.245	1.362	1.158	1.406	2.116
	Less than three months		1.199	1.428	-.373	1.048	1.355	1.006	1.166	2.568
	Three months but less than a year	Upper Bound	1.439	1.462	-.002	1.141	1.166	1.102	1.500	2.018
	A year but less than three years		1.392	1.683	-.165	1.072	1.515	1.181	1.410	2.134
<b>ANOVA</b>		<b>F (4, 373)</b>	3.516	3.239	4.488	4.644	2.772	4.318	5.219	3.966
		<b>Sig.</b>	.008	.012	.001	.001	.027	.002	.000	.004

\*. The mean difference is significant at the 0.05 level.



## Chapter Five

### Discussions of Findings

The study used data collected from 378 US participants and conducted numerous statistical analyses to test the six hypotheses stipulated in Chapter Two. Although all correlational hypotheses were supported, debiasing SCF by increasing dispositional mindful presence and lowering negative affectivity are considered robust findings because they show significant regression parameters when controlling for all other variables, and dominate the other independent variables in the dominance analysis. However, multicollinearity between independent variables cannot be precluded as an explanation of the correlations between the other variables and debiasing SCF. For example, reappraisal shared many of the attributes of the EI measure. This argument is further substantiated when the two moderation hypotheses were not supported. The unsupported moderation effects on the reappraisal-debiasing SCF relationship by either trait-EI or trait-mindfulness may be attributed to the fundamental operationalization of reappraisal. There was perhaps barely any reappraisal at all since the hypothetical scenarios for sunk-cost may have been insufficient to trigger significant emotion during the course of administering the survey. The disconfirmed moderation model seems to suggest that debiasing SCF may have worked in a different way other than the hypotheses implied. Thus, findings for debiasing SCF by positive affect, trait-EI or reappraisal are considered partially robust.

Demographic analysis of the control variables provided a more plausible explanation of the roles played by dispositional affectivity and the tripartite emotion-functioning

capacities in connection with debiasing SCF at trait-level. Trait-mindfulness, the most prominent element contributing to debiasing SCF, has been found to be the key aligning the other elements in debiasing SCF. The findings on the enhancement of upregulating dispositional positive affect, trait-EI, reappraisal and downregulating dispositional negative affect exhibited by long-standing mindfulness meditation practitioners become the core findings. Tantamount to these findings, Chiesa, Calati, and Serretti (2011) claim that long-term meditation practitioners have higher abilities to identify alternative perspectives, display higher positive affect and lower negative affect than non-practitioners. It appears that mindful decision-makers attenuate their susceptibility to SCF by not fixating on the sunk costs incurred in the past, and refraining from experiencing anticipated future regret. Additionally, mindfulness is not just present-centred nonjudgmental awareness but should also be considered as having a retentive ability connected to working-memory as mindfulness retains a focus on the object of attention (Chiesa *et al.*, 2011; Dreyfus, 2011). This mnemonic aspect of mindfulness seems to cause the development of clear comprehension after a prolonged practice of mindfulness meditation. The ultimate goal of this dispositional mindfulness is to attain an insightful understanding of the changing nature of an individual's bodily and mental states in order to free the mind from a general tendency that brings about human suffering (Dreyfus, 2011). The regret-driven SCF is one kind of such suffering and seems likely to be attenuated by trait-mindfulness.

Mindfulness meditation practice appears to accumulate the qualities of state-mindfulness and such retained qualities, in particular lowered negative affect, are exhibited in generic forms in people's daily life. Specifically, Farb, Anderson, Mayberg, Bean, Mckee, and Segal (2010) stressed the importance of mindfulness training in reducing vulnerability to dysphoric reactivity by modifying the neural expression of sadness, the

attribute that leads to more risk-acceptant behaviour such as exhibiting SCF. The foregoing arguments suggest that debiasing SCF by lowered dispositional negative affect may be consequential to the influence of trait-mindfulness. On the other hand, since negative affect can manifest itself even without an overt cause, debiasing SCF by virtue of participants' dispositions of negative affect cannot be ruled out. Further, the finding that the 50+ participants exhibited lower negative affect than the younger counterparts suggests that the phenomenon may be attributed to successful aging (Suri and Gross, 2012) which led to less susceptibility to SCF. The counter-argument that lowered dispositional negative affect relieves susceptibility to SCF by either or both of these reasons is viable, albeit less robust than the argument for debiasing SCF by the effect of trait-mindfulness.

The study's theoretical and empirical underpinnings support the claims that at trait-level when emotion trajectory is not activated: first, trait-mindfulness instead of reappraisal appears to be responsible for maintaining a hedonic mood of higher dispositional positive affect and lower dispositional negative affect for decision-makers; second, trait-mindfulness seems to provide the locus for rectifying decision biases such as the SCF because of its characteristics, particularly the clarity embedded in the retentive capacity as accumulated by constant practice of mindfulness meditation. Overall, these arguments resonate with Peterson's (2014) claim that some professional traders who use daily meditative practice to cultivate mindfulness excel in their business.

### Limitations and future research

Also important to the study are the practicalities of research and their implications for cognitive psychology. The measurement of dispositional negative affect was confined to

nervousness, shame and distress for the sake of simplifying the administration of the survey. However, these affective states may not cover all relevant negative affectivity that SCF relates. Furthermore, the measurement of negative affectivity is complex as it depends on “how people feel about themselves and their world rather than how effectively they may actually handle themselves in the world” (Watson and Clark, 1984: p.466). This characteristic of people’s subjective experience suggests that participants may ascribe different meanings to the same question, which also helps explain that concepts of the SCF was context-dependent to the participants being studied. Therefore, there may be alternative approach that dispositional negative affectivity can be better studied for financial decision-making, for example a controlled experiment. This approach may be able to differentiate whether debiasing SCF by negative affectivity is accomplished by facilitation of mindfulness or on its own merits. Separately, there are at least three schools of thoughts popularising as EI. Besides Mayer *et al.*’s (2004) ability-based model that the study adopted, there are Goleman’s (1998) competence model and personality traits model of Petrides and Furnham (2003). They may have different perspectives on the same thing. Therefore, even if trait-EI was found to significantly associate with debiasing SCF, decision-makers might not be able to know which EI attributes they should develop in order to debias SCF. On the other hand, state mindfulness can be acquired in a relatively short period of time. Even an eight-minute focused breathing meditation can decrease mind wandering in an attention-focused response task (Mrazek, Smallwood, and Schooler, 2012). Mindfulness meditation can be a more effective technique of debiasing cognitive biases than teaching people how to tackle these biases.

In addition to the limitations as discussed in the foregoing section, the following issues are addressed in conjunction with recommendations for future research. First, a cross-

sectional study such as the current research cannot provide cause-and-effect underpinning of the interactions among the key variables under study. Only a longitudinal study or a controlled experiment can establish causal inferences among variables. Therefore, a prospective controlled experiment for state-level measurement may complement the current study. To this end, state mindfulness is induced at the commencement of the experiment and results are compared with a control group. Second, mindfulness' retentive nature and working-memory capacity may share a common locus where emotion can be regulated. A controlled experiment is more desirable to study their performance and interactions. Third, the low internal consistency of the debiasing SCF measure suggests that participants' reactions to the measure was context-dependent, partly due to the construct of the sunk-cost questionnaire and partly due to the common-method approach. This echoes the need to use separate methods to measure debiasing SCF (performance data) and predictor variables (attitudinal data) if the concept of the study were to replicate. Fourth, as discussed emotion trajectory was perhaps not activated in the current study, rendering trait-mindfulness/reappraisal and trait-EI/reappraisal moderation not supported. Yet, the study suggests that these variables are situated in a continuum. A larger sample may offer evidence to support the proposed moderation. Thus, a future research engaging a larger sample would be complementary to the current study if the same measurement is used for a state-level study. Fifth, a post-hoc test on power achieved in the study found that the study was susceptible to Type II error. A larger sample is required to improve results. Appendix-7(ii) shows a priori calculation of required sample for future research based on the sunk-cost/reappraisal correlation. A sample of 1,035 will be needed. The increased sample requirement should be applied with caution largely because a questionnaire-based study is not likely to be adequate

to trigger strong emotions which require reappraisal. Even if it is, the large sample will not be cost effective for a trait-level study as such.

In sum, the study considers that the prominent role of mindfulness in rectifying cognitive biases such as SCF is the key contribution of the study. The sunk-cost bias can cost substantially to a decision-maker while just a brief meditative exercise may improve the quality of financial decision-making. In addition, mindfulness has been found to bring about desirable qualities to people's life, such as their psychological well-being and stress-reductive effect, which unlock people's potential to meet the relentless demands of life.

The overall findings are not an end per se but should be regarded as more reliable means to substantiate concepts on the tripartite emotion-functioning capacities, which in turn encourage future research interest in the domain of cognitive psychology and behavioural economics.

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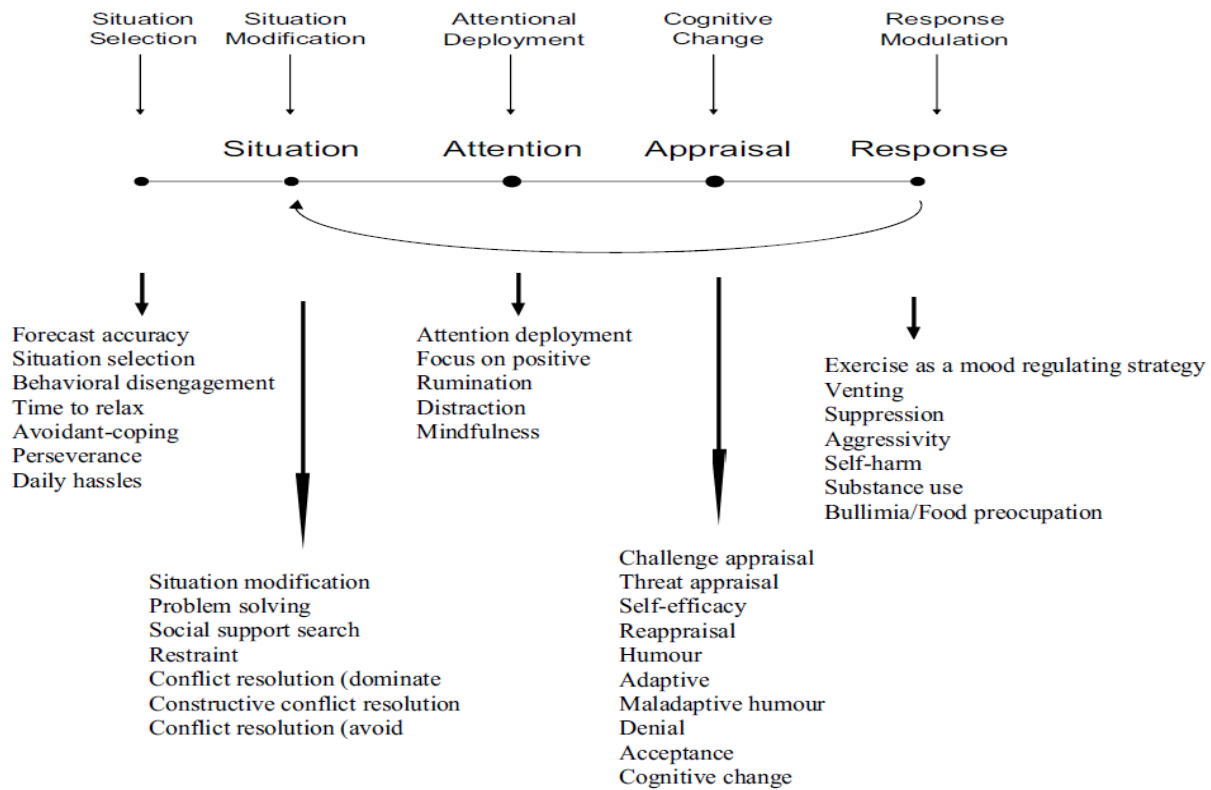
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## Appendix-1 The process model of emotion regulation



Extracted from Peña-Sarrionandia, Mikolajczak, and Gross (2015: p.3).

## Appendix-2 Links between ER processes and emotional intelligence

**Table 1.** Links between emotion regulation strategies and EI\*.

Emotion regulation class	Example strategies	Links to EI
<b>Situation selection</b> (prior to situation)	<i><b>Direct confrontation:</b></i> entering a situation with potential negative emotions, usually with the goal that this short-term unpleasantness will result in long-term benefits	
	<i><b>Avoidance:</b></i> avoiding or escaping a potentially negative or uncontrollable situation	--
<b>Situation modification</b> (during situation)	<i><b>Direct modification:</b></i> direct action to change the situation (also known as task-focused coping)	+
	<i><b>Support-seeking:</b></i> seeking help from others to modify the situation (also known as instrumental social support)	++
<b>Attentional deployment</b> (during attention)	<i><b>Distraction:</b></i> a shift in attention away from the situation	0
	<i><b>Rumination:</b></i> perseverating on the thoughts and feelings associated with the situation	--
<b>Cognitive change</b> (during appraisal)	<i><b>Positive reappraisal:</b></i> reframing one's interpretation of the situation in a more positive way	+
	<i><b>Acceptance:</b></i> acknowledging the situation and one's inability to change it	+
<b>Response modulation</b> (during response)	<i><b>Emotion sharing:</b></i> expressing one's emotions	
	<i><b>Expressive suppression:</b></i> suppressing or hiding the visible behavioral traces of one's emotions	

*Note.* Effect size is shown as zero (0,  $d < .15$ ) small (+;  $d = .15$  to  $.34$ ); medium (++;  $d = .35$  to  $.69$ ) or large (+++;  $d > .7$ ). Negative signs indicate similar magnitudes, but in the opposite direction. Blank cells indicate that, at the time of writing, no data had addressed this relationship.

\*See Peña-Sarrionandia et al. (2015).

Extracted from Mestre *et al.* (2016: p.327)

### Appendix-3 (i) The Questionnaire with scale classification

No.	Question	Scale
1	What is your gender?	CV
2	How old are you?	CV
3	After a large meal at a restaurant, you order a big dessert with chocolate and ice cream. After a few bites you find you are full and you would rather not eat any more of it. Would you be more likely to eat more or to stop eating it?	SC
4	You have been asked to give a toast at your friend's wedding. You have worked for hours on this one story about you and your friend taking drivers education, but you still have some work to do on it. Then you realize that you could finish writing the speech faster if you start over and tell the funnier story about the dance lessons you took together. Would you be more likely to finish the toast about driving or rewrite it to be about dancing?	SC
5	You are buying a gold ring on layaway for someone special. It costs \$240 and you have already paid \$120 on it, so you owe another \$120. One day, you see in the paper that a new jewelry store is selling the same ring for only \$110 as a special sale, and you can pay for it using layaway. The new store is across the street from the old one. If you decide to get the ring from the new store, you will not be able to get your money back from the old store, but you would save \$10 overall. Would you be more likely to continue paying at the old store or buy from the new store?	SC
6	You have been looking forward to this year's Halloween party. You have the right cape, the right wig, and the right hat. All week, you have been trying to perfect the outfit by cutting out a large number of tiny stars to glue to the cape and the hat, and you still need to glue them on. On the day of Halloween, you decide that the outfit looks better without all these stars you have worked so hard on. Would you be more likely to wear the stars or go without?	SC
7	You decide to learn to play a musical instrument. After you buy an expensive cello, you find you are no longer interested. Your neighbor is moving and you are excited that she is leaving you her old guitar, for free. You'd like to learn how to play it. Would you be more likely to practice the cello or the guitar?	SC
8	You and your friend are at a movie theatre together. Both you and your friend are getting bored with the storyline. You'd hate to waste the money spent on the ticket, but you both feel that you would have a better time at the coffee shop next door. You could sneak out without other people noticing. Would you be more likely to stay or to leave?	SC
9	You and your friend have driven halfway to a resort. Both you and your friend feel sick. You both feel that you both would have a much better weekend at home. Your friend says it is "too bad" you already drove halfway, because you both would much rather spend the time at home. You agree. Would you be more likely to drive on or turn back?	SC
10	You are open to the experience of the present moment.	MP
11	When you experience a positive emotion, you know how to make it last.	EI
12	You are able to appreciate yourself.	NJA
13	You are friendly to yourself when things go wrong.	NJA
14	Generally, you are determined in the situations you are in.	PA

Abbreviation: **R** = reappraisal, **EI** = emotional intelligence, **NJA** = nonjudgmental acceptance, **MP** = mindful presence, **PA** = positive affect, **NA** = negative affect, **SC** = **debiasing sunk-cost**, **CV** = control variable, **QC** = quality check

*To be continued on next page ...*

### Appendix-3 (i) The Questionnaire with scale classification

*Continued from previous page*

No.	Question	Scale
15	You experience moments of inner peace and ease, even when things get hectic and stressful.	NJA
16	When you want to feel more positive emotion, you change the way you're thinking about the situation.	R
17	Generally, you feel enthusiastic about things around you.	PA
18	Some of the major events of your life have led you to re-evaluate what is important and not important.	EI
19	You control your emotions by changing the way you think about the situation you're in.	R
20	When you notice an absence of mind, you gently return to the experience of the here and now.	MP
21	In difficult situations, you can pause without immediately reacting.	NJA
22	When you are in a positive mood, solving problems is easy for you.	EI
23	Generally, you are ashamed of yourself.	NA
24	You motivate yourself by imagining a good outcome to tasks you take on.	EI
25	You feel connected to your experience in the here-and-now.	MP
26	When you want to feel less negative emotion, you change the way you're thinking about the situation.	R
27	You expect good things to happen.	EI
28	Generally, you feel nervous about things around you.	NA
29	You have control over your emotions.	EI
30	When you feel a change in emotions, you tend to come up with new ideas.	EI
31	When you want to feel less negative emotion (such as sadness or anger), you change what you're thinking about.	R
32	You pay attention to what's behind your actions.	MP
33	Generally, you feel that you are proud of yourself.	PA
34	When you're faced with a stressful situation, you make yourself think about it in a way that helps you stay calm.	R
35	When you want to feel more positive emotion (such as joy or amusement), you change what you're thinking about.	R
36	Generally, you feel distressed about things around you.	NA
37	When you are in a positive mood, you are able to come up with new ideas.	EI
38	You have high self-esteem.	CV
39	Who is the current U.S. president?	QC
40	What was your personal income last year?	CV
41	What is the highest level of education you have completed?	CV
42	How long have you ever practiced mindfulness meditation regularly?	CV

Abbreviation: **R** = reappraisal, **EI** = emotional intelligence, **NJA** = nonjudgmental acceptance, **MP** = mindful presence,

**PA** = positive affect, **NA** = negative affect, **SC** = **debiasing sunk-cost**, **CV** = control variable, **QC** = quality check



## Appendix-3 (ii) The Questionnaire in the full survey including rubric

### A study of emotions and behavior

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#### Start of Block: Default Question Block



This survey is part of a research study on emotions and behavior. There are no right or wrong answers to the questions. Please give the response that best describes your feelings or reactions.

We expect the survey to take around 10 minutes to complete. The survey will ask you to reflect on your own emotions and thinking and on the ways you behave in a number of everyday life situations. You can withdraw from the survey at any point and the data will be discarded automatically in the system seven days after you have partially completed the survey. You may continue the survey within the first seven days after you started it. Once you have completed the survey please click the next button if you are happy to submit, otherwise just leave the browser for withdrawal from the survey (no response is recorded in this situation).

By proceeding with the survey you acknowledge that:

- 1 the purpose and possible effects of participating in this research have been explained to your satisfaction.
- 2 you understand that that you are free to withdraw from the survey without explanation or prejudice until the survey has been completed and submitted.
- 3 you understand that the confidentiality of the information you provide will be safeguarded subject to any legal requirements
- 4 you understand that with your consent the data generated will be stored by the Open University UK in anonymised form and will be destroyed after a maximum of ten years.
- 5 you understand that that anonymized research data may be made available to other members of the research community subject to the rules of the Open University UK for a period of ten years.

Thank you for your Help with this study. Please click the next button to get started!

Q1 What is your gender?

☐ Female (1)

☐ Male (2)

Q2 How old are you?

☐ Under 21 (1)

☐ 21-29 years (2)

☐ 30-39 years (3)

☐ 40-49 years (4)

☐ 50 and older (5)

Q3 After a large meal at a restaurant, you order a big dessert with chocolate and ice cream. After a few bites you find you are full and you would rather not eat any more of it.

Would you be more likely to eat more or to stop eating it?

☐ Most likely to eat more (1)

☐ More likely to eat more (2)

☐ Likely to eat more (3)

☐ Neutral (4)

☐ Likely to stop eating (5)

☐ More likely to stop eating (6)

☐ Most likely to stop eating (7)

Q4 You have been asked to give a toast at your friend's wedding. You have worked for hours on this one story about you and your friend taking drivers education, but you still have some work to do on it. Then you realize that you could

finish writing the speech faster if you start over and tell the funnier story about the dance lessons you took together. Would you be more likely to finish the toast about driving or rewrite it to be about dancing?

- ☐ Most likely to write about driving (1)
- ☐ More likely to write about driving (2)
- ☐ Likely to write about driving (3)
- ☐ Neutral (4)
- ☐ Likely to write about dancing (5)
- ☐ More likely to write about dancing (6)
- ☐ Most likely to write about dancing (7)

Q5 You are buying a gold ring on layaway for someone special. It costs \$240 and you have already paid \$120 on it, so you owe another \$120. One day, you see in the paper that a new jewelry store is selling the same ring for only \$110 as a special sale, and you can pay for it using layaway. The new store is across the street from the old one. If you decide to get the ring from the new store, you will not be able to get your money back from the old store, but you would save \$10 overall. Would you be more likely to continue paying at the old store or buy from the new store?

- ☐ Most likely to continue paying at the old store (1)
- ☐ More likely to continue paying at the old store (2)
- ☐ Likely to continue paying at the old store (3)
- ☐ Neutral (4)
- ☐ Likely to buy from the new store (5)
- ☐ More likely to buy from the new store (6)
- ☐ Most likely to buy from the new store (7)

Q6 You have been looking forward to this year's Halloween party. You have the right cape, the right wig, and the right hat. All week, you have been trying to perfect the outfit by cutting out a large number of tiny stars to glue to the cape

and the hat, and you still need to glue them on. On the day of Halloween, you decide that the outfit looks better without all these stars you have worked so hard on.

Would you be more likely to wear the stars or go without?

- ☐ Most likely to wear the stars (1)
- ☐ More likely to wear the stars (2)
- ☐ Likely to wear the stars (3)
- ☐ Neutral (4)
- ☐ Likely to not wear the stars (5)
- ☐ More likely to not wear the stars (6)
- ☐ Most likely to not wear the stars (7)

Q7 You decide to learn to play a musical instrument. After you buy an expensive cello, you find you are no longer interested. Your neighbor is moving and you are excited that she is leaving you her old guitar, for free. You'd like to learn how to play it.

Would you be more likely to practice the cello or the guitar?

- ☐ Most likely to play cello (1)
- ☐ More likely to play cello (2)
- ☐ Likely to play cello (3)
- ☐ Neutral (4)
- ☐ Likely to play guitar (5)
- ☐ More likely to play guitar (6)
- ☐ Most likely to play guitar (7)

Q8 You and your friend are at a movie theater together. Both you and your friend are getting bored with the storyline. You'd hate to waste the money spent on the ticket, but you both feel that you would have a better time at the coffee shop next door. You could sneak out without other people noticing.

Would you be more likely to stay or to leave?

- ☐ Most likely to stay (1)
- ☐ More likely to stay (2)
- ☐ Likely to stay (3)
- ☐ Neutral (4)
- ☐ Likely to leave (5)
- ☐ More likely to leave (6)
- ☐ Most likely to leave (7)

Q9 You and your friend have driven halfway to a resort. Both you and your friend feel sick. You both feel that you both would have a much better weekend at home. Your friend says it is "too bad" you already drove halfway, because you both would much rather spend the time at home. You agree. Would you be more likely to drive on or turn back?

- ☐ Most likely to drive on (1)
- ☐ More likely to drive on (2)
- ☐ Likely to drive on (3)
- ☐ Neutral (4)
- ☐ Likely to turn back (5)
- ☐ More likely to turn back (6)
- ☐ Most likely to turn back (7)

Q10 You are open to the experience of the present moment.

- ☐ Never (1)
- ☐ Almost never (2)
- ☐ Infrequently (3)
- ☐ About half the time (4)
- ☐ Frequently (5)
- ☐ Almost always (6)
- ☐ Always (7)

Q11 When you experience a positive emotion, you know how to make it last.

- ☐ Strongly disagree (1)
- ☐ Disagree (2)
- ☐ Somewhat disagree (3)
- ☐ Neither agree nor disagree (4)
- ☐ Somewhat agree (5)
- ☐ Agree (6)
- ☐ Strongly agree (7)

Q12 You are able to appreciate yourself.

- ☐ Never (1)
- ☐ Almost never (2)
- ☐ Infrequently (3)
- ☐ About half the time (4)
- ☐ Frequently (5)
- ☐ Almost always (6)
- ☐ Always (7)

Q13 You are friendly to yourself when things go wrong.

- ☐ Never (1)
- ☐ Almost never (2)
- ☐ Infrequently (3)
- ☐ About half the time (4)
- ☐ Frequently (5)
- ☐ Almost always (6)
- ☐ Always (7)

Q14 Generally, you are **determined** in the situations you are in.

- ☐ Strongly disagree (1)
- ☐ Disagree (2)
- ☐ Somewhat disagree (3)
- ☐ Neither agree nor disagree (4)
- ☐ Somewhat agree (5)
- ☐ Agree (6)
- ☐ Strongly agree (7)

Q15 You experience moments of inner peace and ease, even when things get hectic and stressful.

- ☐ Never (1)
- ☐ Almost never (2)
- ☐ Infrequently (3)
- ☐ About half the time (4)
- ☐ Frequently (5)
- ☐ Almost always (6)
- ☐ Always (7)



Q16 When you want to feel more positive emotion, you change the way you're thinking about the situation.

- ☐ Strongly disagree (1)
- ☐ Disagree (2)
- ☐ Somewhat disagree (3)
- ☐ Neither agree nor disagree (4)
- ☐ Somewhat agree (5)
- ☐ Agree (6)
- ☐ Strongly agree (7)

Q17 Generally, you feel **enthusiastic** about things around you.

- ☐ Strongly disagree (1)
- ☐ Disagree (2)
- ☐ Somewhat disagree (3)
- ☐ Neither agree nor disagree (4)
- ☐ Somewhat agree (5)
- ☐ Agree (6)
- ☐ Strongly agree (7)

Q18 Some of the major events of your life have led you to re-evaluate what is important and not important.

- ☐ Strongly disagree (1)
- ☐ Disagree (2)
- ☐ Somewhat disagree (3)
- ☐ Neither agree nor disagree (4)
- ☐ Somewhat agree (5)
- ☐ Agree (6)
- ☐ Strongly agree (7)

Q19 You control your emotions by changing the way you think about the situation you're in.

- ☐ Strongly disagree (1)
- ☐ Disagree (2)
- ☐ Somewhat disagree (3)
- ☐ Neither agree nor disagree (4)
- ☐ Somewhat agree (5)
- ☐ Agree (6)
- ☐ Strongly agree (7)

Q20 When you notice an absence of mind, you gently return to the experience of the here and now.

- ☐ Never (1)
- ☐ Almost never (2)
- ☐ Infrequently (3)
- ☐ About half the time (4)
- ☐ Frequently (5)
- ☐ Almost always (6)
- ☐ Always (7)

Q21 In difficult situations, you can pause without immediately reacting.

- ☐ Never (1)
- ☐ Almost never (2)
- ☐ Infrequently (3)
- ☐ About half the time (4)
- ☐ Frequently (5)
- ☐ Almost always (6)
- ☐ Always (7)

Q22 When you are in a positive mood, solving problems is easy for you.

- ☐ Strongly disagree (1)
- ☐ Disagree (2)
- ☐ Somewhat disagree (3)
- ☐ Neither agree nor disagree (4)
- ☐ Somewhat agree (5)
- ☐ Agree (6)
- ☐ Strongly agree (7)

Q23 Generally, you are **ashamed** of yourself.

- ☐ Strongly disagree (1)
- ☐ Disagree (2)
- ☐ Somewhat disagree (3)
- ☐ Neither agree nor disagree (4)
- ☐ Somewhat agree (5)
- ☐ Agree (6)
- ☐ Strongly agree (7)

Q24 You motivate yourself by imagining a good outcome to tasks you take on.

- ☐ Strongly disagree (1)
- ☐ Disagree (2)
- ☐ Somewhat disagree (3)
- ☐ Neither agree nor disagree (4)
- ☐ Somewhat agree (5)
- ☐ Agree (6)
- ☐ Strongly agree (7)

Q25 You feel connected to your experience in the here-and-now.

- ☐ Never (1)
- ☐ Almost never (2)
- ☐ Infrequently (3)
- ☐ About half the time (4)
- ☐ Frequently (5)
- ☐ Almost always (6)
- ☐ Always (7)

Q26 When you want to feel less negative emotion, you change the way you're thinking about the situation.

- ☐ Strongly disagree (1)
- ☐ Disagree (2)
- ☐ Somewhat disagree (3)
- ☐ Neither agree nor disagree (4)
- ☐ Somewhat agree (5)
- ☐ Agree (6)
- ☐ Strongly agree (7)

Q27 You expect good things to happen.

- ☐ Strongly disagree (1)
- ☐ Disagree (2)
- ☐ Somewhat disagree (3)
- ☐ Neither agree nor disagree (4)
- ☐ Somewhat agree (5)
- ☐ Agree (6)
- ☐ Strongly agree (7)

Q28 Generally, you feel **nervous** about things around you.

- ☐ Strongly disagree (1)
- ☐ Disagree (2)
- ☐ Somewhat disagree (3)
- ☐ Neither agree nor disagree (4)
- ☐ Somewhat agree (5)
- ☐ Agree (6)
- ☐ Strongly agree (7)

Q29 You have control over your emotions.

- ☐ Strongly disagree (1)
- ☐ Disagree (2)
- ☐ Somewhat disagree (3)
- ☐ Neither agree nor disagree (4)
- ☐ Somewhat agree (5)
- ☐ Agree (6)
- ☐ Strongly agree (7)

Q30 When you feel a change in emotions, you tend to come up with new ideas.

- ☐ Strongly disagree (1)
- ☐ Disagree (2)
- ☐ Somewhat disagree (3)
- ☐ Neither agree nor disagree (4)
- ☐ Somewhat agree (5)
- ☐ Agree (6)
- ☐ Strongly agree (7)

Q31 When you want to feel less negative emotion (such as sadness or anger), you change what you're thinking about.

- ☐ Strongly disagree (1)
- ☐ Disagree (2)
- ☐ Somewhat disagree (3)
- ☐ Neither agree nor disagree (4)
- ☐ Somewhat agree (5)
- ☐ Agree (6)
- ☐ Strongly agree (7)



Q32 You pay attention to what's behind your actions.

- ☐ Never (1)
- ☐ Almost never (2)
- ☐ Infrequently (3)
- ☐ About half the time (4)
- ☐ Frequently (5)
- ☐ Almost always (6)
- ☐ Always (7)

Q33 Generally, you feel that you are **proud** of yourself.

- ☐ Strongly disagree (1)
- ☐ Disagree (2)
- ☐ Somewhat disagree (3)
- ☐ Neither agree nor disagree (4)
- ☐ Somewhat agree (5)
- ☐ Agree (6)
- ☐ Strongly agree (7)

Q34 When you're faced with a stressful situation, you make yourself think about it in a way that helps you stay calm.

- ☐ Strongly disagree (1)
- ☐ Disagree (2)
- ☐ Somewhat disagree (3)
- ☐ Neither agree nor disagree (4)
- ☐ Somewhat agree (5)
- ☐ Agree (6)
- ☐ Strongly agree (7)

Q35 When you want to feel more positive emotion (such as joy or amusement), you change what you're thinking about.

- ☐ Strongly disagree (1)
- ☐ Disagree (2)
- ☐ Somewhat disagree (3)
- ☐ Neither agree nor disagree (4)
- ☐ Somewhat agree (5)
- ☐ Agree (6)
- ☐ Strongly agree (7)

Q36 Generally, you feel **distressed** about things around you.

- ☐ Strongly disagree (1)
- ☐ Disagree (2)
- ☐ Somewhat disagree (3)
- ☐ Neither agree nor disagree (4)
- ☐ Somewhat agree (5)
- ☐ Agree (6)
- ☐ Strongly agree (7)

Q37 When you are in a positive mood, you are able to come up with new ideas.

- ☐ Strongly disagree (1)
- ☐ Disagree (2)
- ☐ Somewhat disagree (3)
- ☐ Neither agree nor disagree (4)
- ☐ Somewhat agree (5)
- ☐ Agree (6)
- ☐ Strongly agree (7)

Q38 You have high self-esteem.

- ☐ Strongly disagree (1)
- ☐ Disagree (2)
- ☐ Somewhat disagree (3)
- ☐ Neither agree nor disagree (4)
- ☐ Somewhat agree (5)
- ☐ Agree (6)
- ☐ Strongly agree (7)

Q39 Who is the current U.S. president?

- ☐ Barack Obama (1)
- ☐ Hillary Clinton (2)
- ☐ Donald Trump (3)

Q40 What was your personal income last year?

- ☐ \$0-14,999 (1)
- ☐ \$15,000-29,999 (2)
- ☐ \$30,000-59,999 (3)
- ☐ \$60,000+ (4)
- ☐ Don't know (5)

Q41 What is the highest level of education you have completed?

- ☐ Secondary school (1)
- ☐ High school graduate / technical or vocational training (2)
- ☐ Undergraduate study (3)
- ☐ University graduate (4)
- ☐ Postgraduate study (5)
- ☐ Decline to say (6)

Q42 How long have you ever practiced mindfulness meditation regularly?

- ☐ Never or had practiced but soon discontinued (1)
- ☐ Less than three months (2)
- ☐ Three months but less than a year (3)
- ☐ A year but less than three years (4)
- ☐ Three years or more (5)

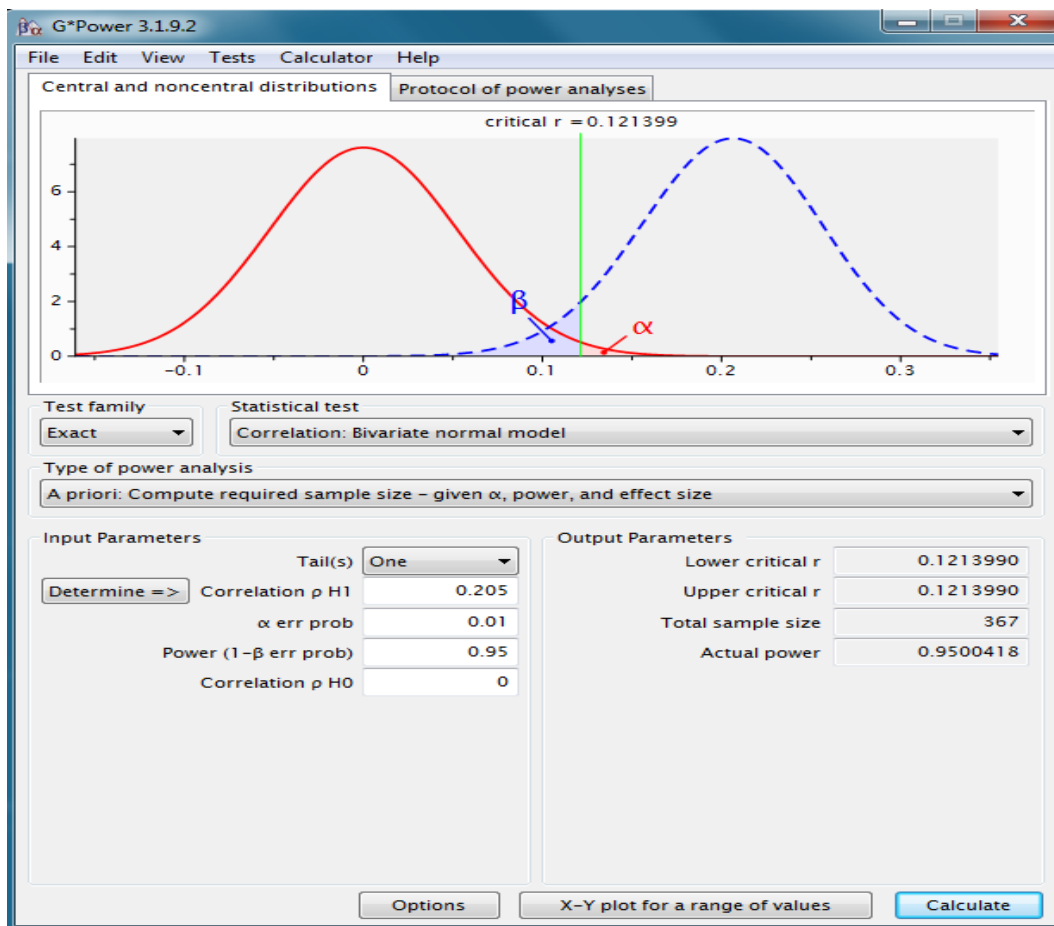
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Q43 If you are satisfied with your selected answer choices, please click submit.

**End of Block: Default Question Block**

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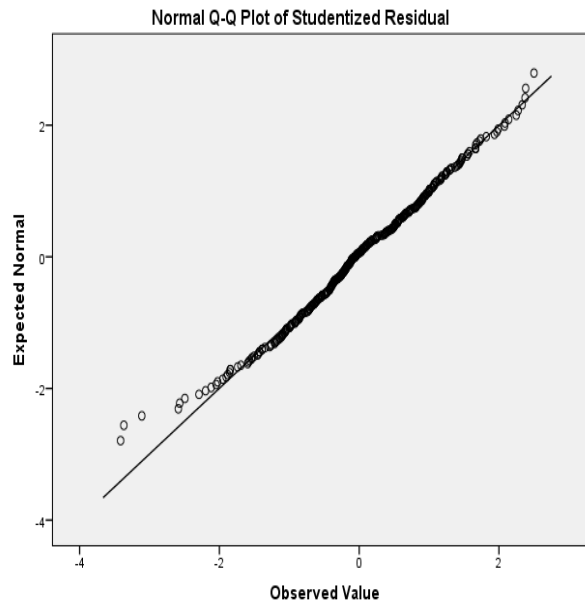
#### Appendix-4 A priori calculation of required sample size from G\*Power programme



# Appendix-5 Tests of normality before and after the three outliers were excluded from the sunk cost / reappraisal bivariate

(i) N = 381

Descriptives			Statistic	Std. Error
Studentized Residual	Mean		0.0000820	0.0513181
	95% Confidence Interval for Mean	Lower Bound	-0.1008210	
		Upper Bound	0.1009849	
	5% Trimmed Mean		0.0136931	
	Median		-0.0605871	
	Variance		1.003	
	Std. Deviation		1.0016888	
	Minimum		-3.41428	
	Maximum		2.50069	
	Range		5.91497	
	Interquartile Range		1.30855	
	Skewness		-0.200	0.125
	Kurtosis		0.411	0.249



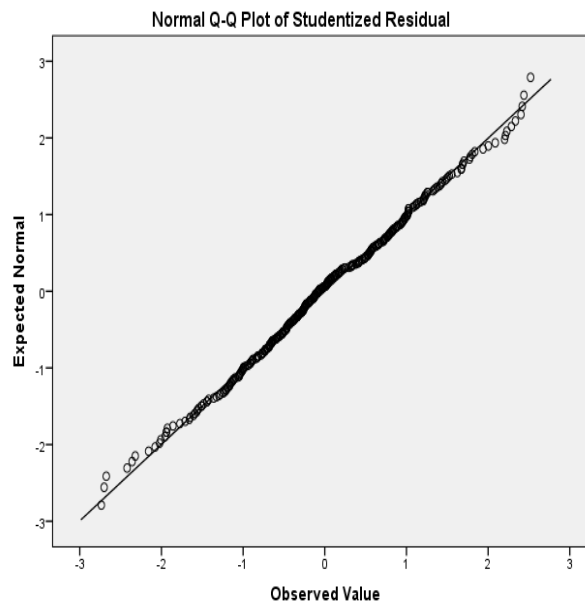
Tests of Normality						
	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Studentized Residual	0.034	381	.200 <sup>*</sup>	0.993	381	0.056

\*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

(ii) N = 378

Descriptives			Statistic	Std. Error
Studentized Residual	Mean		0.0001732	0.0515159
	95% Confidence Interval for Mean	Lower Bound	-0.1011212	
		Upper Bound	0.1014677	
	5% Trimmed Mean		0.0018166	
	Median		-0.0819811	
	Variance		1.003	
	Std. Deviation		1.0015832	
	Minimum		-2.73605	
	Maximum		2.51971	
	Range		5.25577	
	Interquartile Range		1.37771	
	Skewness		0.008	0.125
	Kurtosis		-0.080	0.250



Tests of Normality						
	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Studentized Residual	0.038	378	.200 <sup>*</sup>	0.996	378	0.385

\*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

## Appendix-6 Tests of normality before and after the three outliers were excluded from the sunk cost / EI bivariate

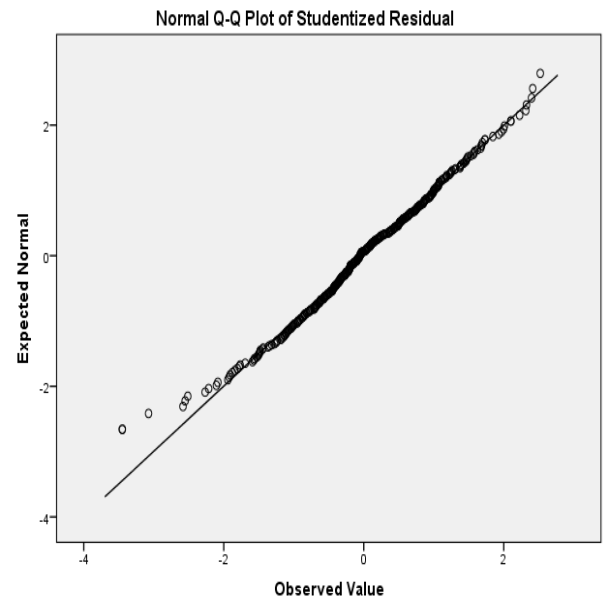
(i) N = 381

Descriptives				Statistic	Std. Error
Studentized Residual	Mean			-0.0000164	0.0513183
	95% Confidence Interval for Mean	Lower Bound		-0.1009197	
		Upper Bound		0.1008870	
	5% Trimmed Mean			0.0131202	
	Median			-0.0571477	
	Variance			1.003	
	Std. Deviation			1.00169256	
	Minimum			-3.44914	
	Maximum			2.52089	
	Range			5.97004	
	Interquartile Range			1.32095	
	Skewness			-0.204	0.125
	Kurtosis			0.448	0.249

Tests of Normality						
	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Studentized Residual	0.037	381	.200	0.993	381	0.055

\*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

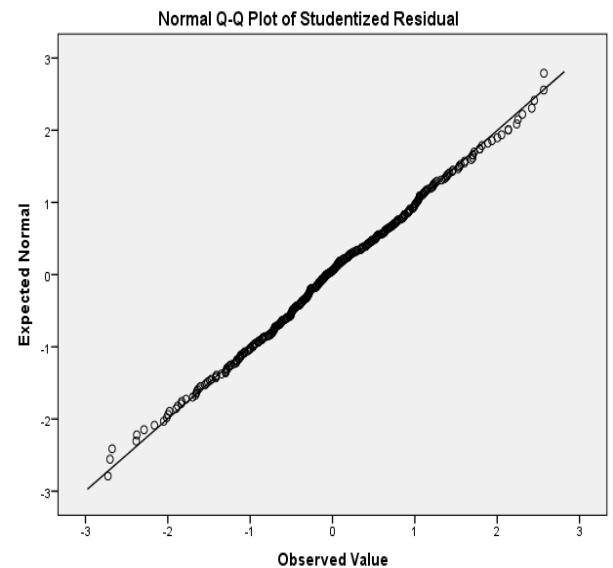


(ii) N = 378

Descriptives				Statistic	Std. Error
Studentized Residual	Mean			0.0000878	0.0515130
	95% Confidence Interval for Mean	Lower Bound		-0.1012011	
		Upper Bound		0.1013767	
	5% Trimmed Mean			0.0004935	
	Median			-0.0725819	
	Variance			1.003	
	Std. Deviation			1.00152779	
	Minimum			-2.72704	
	Maximum			2.56738	
	Range			5.29442	
	Interquartile Range			1.35730	
	Skewness			0.015	0.125
	Kurtosis			-0.064	0.250

Tests of Normality						
	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Studentized Residual	0.042	378	0.147	0.996	378	0.543

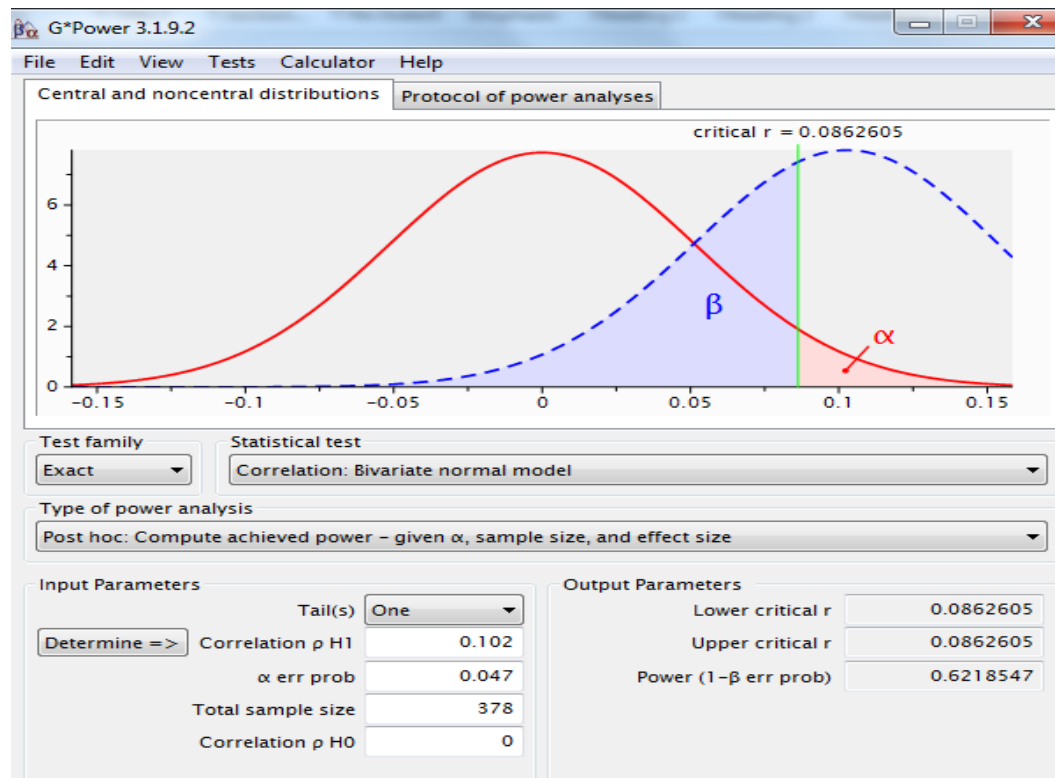
a. Lilliefors Significance Correction





## Appendix-7 Calculations from G\*Power 3.1.9.2 programme

### (i) Post-hoc probing of achieved power for the current study



### (ii) A priori calculation of required sample size for future research

